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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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607TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

+ + + + +

OPEN SESSION

+ + + + +

THURSDAY,

SEPTEMBER 5, 2013

+ + + + +

ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 A.m., J. SAM ARMIJO, Chairman, presiding.

MEMBERS PRESENT:

J. SAM ARMIJO, Chairman

JOHN W. STETKAR, Vice Chairman

HAROLD B. RAY, Member-at-Large

RONALD BALLINGER

SANJOY BANERJEE

MEMBERS PRESENT (Continued):

DENNIS C. BLEY

CHARLES H. BROWN, JR.

MICHAEL L. CORRADINI

DANA A. POWERS

JOY REMPE

PETER RICCARDELLA

MICHAEL T. RYAN

STEPHEN P. SCHULTZ

GORDON R. SKILLMAN

ACRS CONSULTANT PRESENT:

KORD SMITH*

NRC STAFF PRESENT:

PETER WEN, Designated Federal Official

JOHN LAI, Designated Federal Official

ZEYNA ABDULLAHI, Designated Federal Official

MIKE BALAZIK, NRR/DIRS

CHAKRAPANI BASAVARAJU, NRR/DE

TERRY BELTZ, NRR/DORL/LPL3-1

RON FRAHM, NRR/DIRS/IPAB

RANI FRANOVICH, NRR/DIRS/IPAB

DONNIE HARRISON, NRO/DSRA

ALLEN HOWE, NRR/DORL

KERRI KAVANAGH, NRO/DCIP/QVIB

ANTHONY McMURTRAY, NRR/DE

NRC STAFF PRESENT (Continued):

JOHN MONNINGER, NRR

MARK ORR, RES/DE/RGDB

ERIC POWELL, NRO/DSRA

AHSAN SALLMAN, NRR/DSS/SCVB

FRANK TALBOT, NRO/DCIP/QVIB

ALSO PRESENT:

BIFF BRADLEY, NEI

RAYMOND DENNIS, Westinghouse

STEPHEN HAMBRIC, Penn State University

STEVE HAMMER, NSPM

NATE HASKELL, NSPM

MARK SCHIMMEL, NSPM

VIKRAM SHAH, ANL*

RICK STADTLANDER, NSPM

SAMIR ZIADA, McMaster University

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*Participating via telephone

TABLE OF CONTENTS

P-R-O-C-E-E-D-I-N-G-S

(8:28 a.m.)

1) OPENING REMARKS BY THE ACRS CHAIRMAN

CHAIR ARMIJO: Good morning. Good morning. The meeting will now come to order. This is the first day of the 607th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: first, Monticello extended power uprate application; second, NRC staff's proposed response to the staff requirements memorandum on SECY-12-0081, "Risk-Informed Regulatory Framework for New Reactors"; third, draft final regulatory guide 1.79 and 1.79.1; and, fourth, preparation of ACRS reports.

A portion of the session on Monticello extended power uprate application may be closed pursuant to 5 USC 5522(b)(c)(4) to protect proprietary information applicable to these matters. Dr. Pete Riccardella and Dr. Ron Ballinger, our new ACRS members, are attending in their first official capacity as members.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Peter Wen is a designated federal official for the initial portion of the meeting.

We have received no written comments or requests to make oral statements from members of the public regarding today's sessions.

There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed in a listen-in mode during the presentations and Committee discussion.

The transcript of portions of the meeting is being kept. And it is requested that speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

As an item of interest, I would like to -- I mentioned that already, that Drs. Ballinger and Riccardella are here for the first time. And they can finally get paid.

(Laughter.)

With that, I would like to turn it over to --

MEMBER CORRADINI: We don't pay? I thought that was what I was going to do. I've been writing a check.

CHAIR ARMIJO: They haven't been paid for a long time. Okay. I'd like to turn it over to Dr. Joy Rempe, who will lead us through the presentations.

MEMBER REMPE: Thank you, Mr. Chairman.

2) MONTICELLO EXTENDED POWER UPRATE APPLICATION

2.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

MEMBER REMPE: Our Subcommittee on Power Uprates reviewed the Monticello's nuclear generating plant, the extended power uprate license amendment request on July 25th and 26th of this year.

Subcommittee members had the opportunity to review the staff safety evaluation, the licensee's power uprate safety analysis report, staff requests for additional information with licensee responses. At this time, I believe that the consensus of our subcommittee is that the Monticello nuclear generating plant EPU application is ready to go forward to the full Committee for consideration at today's meeting.

Many of the topics that we reviewed during our Subcommittee meeting were similar to matters that we reviewed in past EPUs. However, there were two topics that were of special interest to our Subcommittee. The first topic is the licensee's request for containment accident pressure credit. This LAR is the first EPU requesting CAP credit that has applied the guidance found in SECY-11-0014. The second topic pertains to the replacement steam dryer. There is a licensing condition, however, for

monitoring during power ascension testing that provides reasonable assurance that unanticipated vibration modes induced in the steam dryer will be detected and addressed. Today we are going to hear presentations on both of these topics and other issues of interest.

As you have noticed, some of the presentations contain proprietary information. So part of our session will be a closed session.

And at this point, I would like to turn our meeting over to the staff. And I believe that John Monninger will present the presentations.

2.2) BRIEFING BY AND DISCUSSIONS WITH REPRESENTATIVES OF THE NRC STAFF AND NORTHERN STATES POWER COMPANY

MR. MONNINGER: Good morning. Thank you, Dr. Rempe, Chairman Armijo. I am John Monninger, the Deputy Director for the Division of Operating Reactor Licensing from NRR's Office of Nuclear Reactor Regulation. I guess on behalf of the staff, I would also like to welcome the new members, the two new members, to the ACRS. And hopefully the staff will be able to provide an informative, productive discussion to sort of establish the way the future interactions between the staff and the --

MEMBER POWERS: John, are you going to explain to them this is the nicest thing that will be said to them?

(Laughter.)

MR. MONNINGER: Or how we'll try to dodge all the questions.

MEMBER CORRADINI: You'll answer one question. Then we're back to the normal.

MR. MONNINGER: Back to the norm. With that, I think another thing that is important to recognize here is to acutally thank the ACRS and the staff. When we discussed the planning for this review, there was considerable uncertainty with regard to the staff's schedule and when we would be able to complete the SER; in particular, the review associated with the steam dryer. The ACRS was very, very accommodating to us in the discussions up to and through the Subcommittee meeting. We're very appreciative of that consideration.

One thing I did mention at the past meeting, the success of the NRC's power uprate program and how it was an important program for licensees and the NRC staff to ensure that we continue to provide safety in these applications. There have been some recent changes I thought maybe of interest to the ACRS

with regard to the extended power uprates that we had been anticipating to come in. Just recently over the past summer, three of those have canceled by licensees out there. So with this review, Monticello and then subsequently Peach Bottom within the next year or so, and then Browns Ferry, they would essentially be the end of the extended power uprates that we have on our plates and looking into the future, the next, you know, three, four, five years or so.

There are a few unannounced measurement uncertainty recapture power uprates that would be forthcoming, but with regard to a significant number of power uprates, the staff does not foresee any in the near term.

Also, I would just like to mention that there were very good collaborative discussions focused on resolving the steam generator issues between the NRC staff and the licensee. And we are very appreciative of those positive interactions.

MEMBER SKILLMAN: Steam dryer?

MR. MONNINGER: The steam dryer. Thank you.

MEMBER CORRADINI: Dryer. Generator.

MR. MONNINGER: Thank you. Thank you. Sorry about that.

And, with that, I'll turn it over to Terry to round out our discussion.

MR. BELTZ: Okay. Thank you, John.

My name is Terry Beltz. I am the Senior Project Manager in the Division of Operating Reactor Licensing. And my plants are Monticello and Point Beach. To parrot what John said, on behalf of the NRC staff, I want to take this opportunity to thank the ACRS members for accommodating the Monticello EPU review.

The next two hours, you are going to hear presentations from Xcel Energy and the staff. And the objective is to provide sufficient information related to the details of the EPU application and the evaluation supporting the staff's reasonable assurance determination that health and safety of the public will not be endangered by the operation of the proposed EPU.

The topics for discussion today, Dr. Rempe went over most of those. There are three specific topics that came out of the Subcommittee sessions, at least in going through the transcripts and going through the closing comments. The licensee is going to be starting off with an EPU overview presentation and a discussion of plant modifications and safety

margin improvement.

The staff will then do a containment review presentation and discussion of containment accident pressure and also then a steam dryer review and analysis presentation.

I've included at the end of the presentation of the agenda some, about ten minutes for, topics for discussion. I am sloughing the schedule if we need to go over, there is some additional information that the members want to hear. And each of these presentations is about 30 minutes and then the topics for discussion, an additional 10 minutes if we need it.

I don't know if we want to talk about what may occur today with the evacuation. I talked to the --

(Laughter.)

MR. BELTZ: I'll just bring it up right now.

CHAIR ARMIJO: Terry, that's supposed to be a secret.

(Laughter.)

MR. BELTZ: We are long overdue for an evacuation drill. And there has been rumor today and yesterday that we may need to. Just to let you know,

if we do have that drill, I would ask that those visitors under my name muster follow with me. And we'll go to the muster area for NRR. Once the evacuation drill, if it occurs, is complete, we'll just try to figure out how to get everybody back here. I've got John and myself. We could probably have no problem getting everybody back here in an expeditious manner. So it's just a head's up.

That concludes my introduction as far as the discussion topics go. Does anyone else have any questions for me?

MEMBER BANERJEE: Do they have to hand the badges back?

MEMBER REMPE: We'll figure it out.

MEMBER CORRADINI: This is a question you can ignore.

MR. BELTZ: Okay. I'll turn the presentation over to, I guess, Mr. Mark Schimmel.

MR. SCHIMMEL: Good morning.

(Whereupon, there was a chorus of "Good morning.")

MR. SCHIMMEL: My name is Mark Schimmel. I am Vice President for Xcel Energy. I want to thank, of course, everybody in this room for the opportunity to sit here once again and present to the ACRS. We

will answer any and all questions to the best of our ability.

So I will cover some of the topics today. I've got Nate Haskell, my Engineering Director from Monticello, sitting to my left. Rick Stadtlander is to the right now. Rick is former Shift Manager and now the Ops Support Manager. He will be answering a lot of questions. Mr. Hammer, who is to my right, will answer the EPU licensing. He is the Project Manager for our EPU project and can answer pretty much any type of question one would have regarding this subject.

I will cover the overview. I will turn it over throughout the presentation to each member of the staff that is up here and take questions as they come up. We will cover the overview, the plant modifications, and then any margin questions that may come up, how we address those.

All right. The operating license was issued almost 42 years ago, September 8th of 1970, a few days away. And we went commercial June 30th of 1971 conditionally. And then full-term operating license was issued January 9th of 1981.

We are a GE BWR 3 with a Mark 1 containment. The original license thermal power limit

was 1,670 megawatts thermal, and we did a slight power uprate in 1998 to our current license thermal power of 1,775. We did some turbine work in '96 and some analytical work, which allowed us to come up and power to where we sit today at 1,775. We're going to be moving forward here in 2013 to 2,004 megawatts thermal. That is a 20 percent power uprate from the original license thermal power license that we received. And it's about 12.9 percent from where we sit today.

EPU application is based on license topical reports. And you can see them listed there. That's just to let you know that we followed the guidance. We didn't step sideways on this in any way. We do use a constant reactor pressure uprate. And a 12.9 percent on the current licensed thermal power is considered optimal for our design, which we will discuss as we go through this today. It also is compatible with our fuel cycle capabilities and operating margins.

There is a table that shows basically an overview of the parameter changes for core thermal power. You can see what that was through where we are headed. The flow rates, not much change there, a little bit on the low end. Full power core flow range

in percent, as you can see there, a slight increase on the lower end on the EPU. Steam dome pressure went unchanged, vessel steam flow slightly increased, along with feedwater flow rate, which one would expect. And the final feedwater temperature went from 383 to 402.

All right. At this point, I would like to turn over the presentation to Mr. Haskell. Are you ready to cover the modifications?

MR. HASKELL: Sure.

MR. SCHIMMEL: All right.

MR. HASKELL: Thanks, Mark.

Good morning. My name is Nate Haskell. I am the Engineering Director at Monticello.

This first slide just shows an overview of the major modifications. You can see that we did replace the steam dryer. Obviously we are going to increase reactor core power. We replaced and increased the capacity of the main transformers, both the main power transformer as well as our emergency transformers. We rewound our generator, replaced our high-pressure turbine. We also replaced our condensate pumps and feedwater pumps and put in a new 13.8 kV power supply to power the condensate pumps, feedwater pumps, as well as the recirc MG set motors. So we have a whole new power supply system for those

components.

We replaced the condensate demineralizers, the increased-capacity demineralizers. And we also replaced the feedwater heaters.

This is a list of the major modifications to improve reliability and operating margins, pretty much the list that I just went through.

Next slide, please. This is a picture of the replacement steam dryer. This is a Nordic design steam dryer. The OEM steam dryer that we had had a quality that varied from 99.87 percent to 99.998 percent with an average of 99.936 percent quality at CLTP, or current licensed thermal power. The replacement steam dryer has been in service for a little over cycle now. And it has a quality of greater than 99.99 percent and essentially no variation in that quality.

MEMBER POWERS: When you quote qualities for your current steam dryer, these are determined how?

MR. HASKELL: Our current steam dryer is the Nordic design. We acutally had that in service coming out of the 2011 outage. So it's been in service for a cycle, and it currently is in service.

MR. SCHIMMEL: I think he's asking, how do

you determine steam quality.

MEMBER POWERS: Yes, yes. Are you quoting this measured numbers or calculated numbers? That's really what I want to know.

MR. HASKELL: Oh, it's based on measurements.

MEMBER POWERS: Oh, okay.

MR. HASKELL: This picture is of our new feedwater, one of our new feedwater, heaters.

MEMBER BANERJEE: Are the measurements by heat balance or is it actually capturing a sample and --

MR. HASKELL: No. It's a heat balance.

MEMBER BANERJEE: Balance, yes.

MR. HAMMER: There is a sodium 24 test that they do.

MEMBER BANERJEE: Okay.

MR. HAMMER: So yes, they measure --

MEMBER BANERJEE: To calibrate.

MR. HAMMER: Yes.

MR. HASKELL: So we replaced the 13, 14, and 15 series of feedwater heaters at the plant. We also qualified our number 11 and number 12 feedwater heaters for EPU operation. And we increased the size of the drain piping from the heaters.

This is a picture of our new feedwater pumps and motors. The old feedwater pumps, reactor feed pumps, were 6,000 horsepower. The CLTP runout capability was about eight percent beyond the normal design flow. New feed pumps are 8,000 horsepower. And the runout capability is about 14.4 percent beyond the design flow, which is about 18,180 gallons per minute.

MR. HAMMER: And these are around 13.8.

MR. HASKELL: And they are powered from the 13.8 bus system. That is correct.

This is a picture of the condensate pumps and motors. We are at about 1,750 horsepower, 4,000 volt for the previous condensate pumps. The new pumps are 2,400 horsepower. And they all serve power from the 13.8 kV system. They have a capacity of about 11,000 gpm each.

We also, as I mentioned, replaced the condensate demineralizers with increased capacity. The flow rate through the condensate demin system capability after power uprate was 17,270 gallons a minute. It was 14,500 before power uprate.

We are getting conductivity effluent at about 0.06 microsiemens per centimeter, which is pretty much pure water.

This next picture just shows the new controller for the condensate demineralizer. That was one of the modifications since we were increasing the capacity of the vessels. We ended up changing out the controller to a new state-of-the-art programmer/controller to facilitate operating the unit.

As I mentioned, we did as part of 13.8 upgrade change out the MG set motors. And they also have a new digital control panel for our recirc pumps. And then, finally, as part of modifications here, we replaced the high-pressure turbine with a new rotor and turbine design so that it will facilitate the EPU power loads.

At this point, I will turn it over to Rick Stadtlander to talk about the electrical system. Rick?

MR. STADTLANDER: All right. Good morning. My name is Rick Stadtlander. I think I was introduced before. I am a shift manager, old SRO license right now, and currently taking over a new role here as Ops Support Manager. So I'm talking about some of the electrical modifications here.

We did rewind the generator. And that increased the available output from 664 MVA to 718

MVA, so well within the extended power uprate here that we are expecting.

In the process, we also changed out the voltage regulator and the power system stabilizer as part of this. And we also replaced the exciter and took the opportunity to change out our standard water cooling heat exchangers as well, so gave a pretty good retrofit to the entire system there.

Our subyard at Monticello is fairly unique. Currently we have eight transmission lines in our subyard. As part of this, we actually did add one new line into this. So we now have 3 345 kV lines. We have 3 315 kV lines and 2 230 kV lines. So from a nuclear plant standpoint, our substation is very robust.

While we were upgrading and adding that new line, we acutally upgraded to a breaker and a half scheme, which means that we can take any line out without impacting the other input or output lines and being able to isolate that one line specifically without impacting any of our off-site sources. All right?

I just wanted to point out some of the new technology that we used as we installed the new line. We did use explosive charges or, actually, explosive

splices in order to splice together the new lines. It is acutally something that our parent company, Xcel Energy, is using now quite extensively, but this is kind of one of the first times that we had seen it for sure. So it was a newer technology, like I said, and actually supplies a better joint than the old methods.

MEMBER STETKAR: This is what happens when you put 345 across 13.2.

(Laughter.)

MR. HASKELL: We thought about taking this one out.

(Laughter.)

MEMBER CORRADINI: I'm very surprised it isn't out considering things.

MEMBER STETKAR: Even on the shield lines, huh?

MR. STADTLANDER: Yes. Yes. We used it in all of those. Actually, they timed it all right where you can see they were all going off at one time there.

MR. HASKELL: Is that a bird that I see?

MR. STADTLANDER: No birds were harmed in that. Like it has here, it did garner a lot of attention at the plant when we did it because we had to make sure that we made the appropriate

announcements, everybody knew what was happening. But it was one of the new exciting things that did happen at the plant as part of these modifications.

Let's see. As we talked about, we did update the new main transformer or the main transformer as well, upgraded that from 650 MVA to approximately 800 MVA. And this was mainly a life cycle management modification in order to replace the aging component. So this was going to happen regardless. But with the EPU, we did increase the margin for this upgraded unit.

We do have one normal source of power into the plant from off-site source and another fully capable off-site source transformer as well. We normally are powered off of our 2R transformer, which is the one on your right, the blue and orange one, kind of unique colors to the industry here as well. That is our normal source of power into the plant. It does take 34.5 kV coming into it. And one of the reasons why we had to change this is because of our new 13.8 kV distribution system that we put into place.

In the past, both of these transformers had dual 4 kV winding outputs into the plant. What we had to do as part of this is change one of those

windings to 13.8. So input on our main source is 34.5 kV with the output being 13.8 on one winding and 4 kV on the other winding. And, like I alluded to, the one on the left, the maroon and gold one there, is our fully capable backup source. So we can power the station completely off of either one of these transformers. So if we have to do maintenance for any reason, we can take one out of service and supply the plant off the other one.

We talked about the 13.8 kV distribution system that we added. The main reason we did this is for the condensate and feed pump motors. The decision was made early on in the modification process that we couldn't get the output that we needed out of the four kV motors that we had previously. So we upgraded to 13.8 kV motors in that. As part of that, our recirc MG set motors came into the 13.8 kV distribution system as well.

So, as you can see from the picture here, it is all nice new switchgear. And we have actually upgraded to the electronic relays for this application. So that's --

MEMBER BROWN: By "electronic relays," you mean microprocessor --

MR. STADTLANDER: Correct.

MEMBER BROWN: -- software-controlled?

MR. STADTLANDER: Correct, not the electromechanical that are current four kV system --

MEMBER BROWN: And I think I asked the question at the Subcommittee meeting. There are no inputs from your transmission. Whatever you call the guy --

MR. STADTLANDER: Yes.

MEMBER BROWN: -- that controls the outside, there is no access of any internet controls or anything else into these. These are all within the plant itself?

MR. STADTLANDER: These are all within the plant itself, correct. Yes.

MEMBER BROWN: Have fun.

MR. STADTLANDER: We will. It has been an interesting learning curve up to this point. So they have been tested. We did go through that. So it's been a good change to the plant, though.

With that, Steve Hammer will take it over and talk about our margin improvement.

MR. HAMMER: Okay. My name is Steve Hammer. I am the Project Manager for the licensing piece, basically in charge of doing a lot of the analysis to support the license amendment.

As Mr. Haskell and Mr. Stadtlander pointed out, we did a lot of modifications that increased the margin of a number of different systems and components to the plant. What I am going to discuss here is some of the additional things. There is a host of additional things that we could talk about, but these are some of the main things.

Some of the changes that happened in the same time frame as the license amendment is there is a HELB barrier that we have enhanced for the lower four kV room. One of the issues at Monticello is there is some susceptibility to flood issues for the lower four kV room. So what we did is we increased the size of that HELB barrier so it's now seven feet tall to provide substantial additional margins for flooding from possible HELB breaks.

We changed the failure position for the condensate demineralizer outlet valve from fail close to fail as-is. And what that does is that helps in PRA space to ensure that the condensate demins do not interrupt flow to the reactor for the reactor feedwater system.

One of the additional changes we made was for one of our service water pumps, we have three normal service water pumps. These are not

safety-related pumps, but they are the pumps that provide the normal cooling water for the site. One of those pumps, number 11, was relocated to a diesel-backed source so that in the event of loss of off-site power, these pumps are normally not powered up by the emergency diesel generators. And this one was moved to an additional diesel generator that is available so that these pumps could theoretically be available with a loss of off-site power.

The instrument air system was also upgraded. One of the challenges at Monticello in the early days of plant operation was just air system capacity and air system quality, although we could keep the air dry and filtered. And so what we have done is we have substantially changed out all of the original air compressors and put in larger air compressors, larger air dryers. And so we have substantially improved the quality of the air system at Monticello.

The reactor water cleanup pumps were also replaced. The license amendment application for Monticello was based on the assumption that those pumps would not be replaced and what we ended up doing so that what was analyzed was a slight degradation and reactor water cleanup system performance. We did in

the end increase the capacity of those reactor water cleanup pumps to maintain the capacity the same as the original capacity that we have prior to the power uprate. So that modification also happened.

MEMBER STETKAR: Steve, was that strictly for cleanup capacity, not for makeup capacity?

MR. HAMMER: Yes. It's just strictly cleanup capacity.

As Rick talked about, we did improve the generator and the exciter. Some of that work was related, was required in order to do EPU, but, for example, the exciter replacement was done due to end of life. We increased the size and the capacity in the exciter to kind of improve the margins there also as we did that work.

The isophase bus coolers at Monticello, the original isophase bus coolers, we used to have one cooler, one fan. So we didn't have any redundancy there. It was a single point of failure that could result in loss of a unit very easily. What we did is we replaced that with larger fans, larger coolers. And they're not redundant. So we do have some redundancy there. So if one fan does die, we can automatically transfer to the redundant fan.

MEMBER SKILLMAN: Steve, on the condensate

demineralizer outlet valve failure position, fail as-is, is that just one or all five failing as is?

MR. HAMMER: It's all five.

MEMBER SKILLMAN: All five. Thank you.

MR. HAMMER: The next slide, "Additional Margin Improvements." As part of this work, obviously EPU does impact the high-energy line break program, the MOV, and the AOV program in the EPU. As part of this work, though, we also redid all of these programs from birth to death. So we reverified all of the inputs, revalidated all of the assumptions. We made sure that they were all in compliance with our license basis. And all of these programs were entirely redundant as part of this effort for both portions that were impacted by EPU and for those portions that are not impacted by EPU. So this was a major effort to bring this, all of these programs, up to the current state-of-the-art performance.

So that's all I've got. Oh, we have one more, -- sorry -- the transient and accident analysis. This is just a summary of the significant temperatures and pressures that are temperatures here that are impacted by EPU. I'm not going to go through these in any kind of specific detail, but it does show that while the EPU does in general increase these values,

most of the increases are very nominal.

So does anybody have any questions on any of this?

MEMBER POWERS: They're small except for the station blackout.

MR. HAMMER: Yes. Station blackout is -- you know, the primary change on station blackout is associated with the fact that we do have a higher power level, but the --

MEMBER POWERS: That's a untrivial factor.

MR. HAMMER: Yes, absolutely. That shows you. And the station blackout is a little bit of a unique event in that you have no cooling at all going to the primary containment at the time. So that just shows the impact of EPU on the suppression pool temperature.

The thing that you could say about station blackout that's good is we did look at the heat capacity temperature limit. Monticello does not exceed the heat capacity temperature limit at the end of four hours. So we're still within the original assumptions for being able to mitigate the accident.

PARTICIPANT: Coping time.

MR. HAMMER: Yes. The coping time of four hours hasn't changed from CLTP to EPU. So while the

temperature is higher, it doesn't require any significant procedure changes to mitigate the amount.

MEMBER BROWN: Does that mean you had a longer coping time for it?

MR. HAMMER: No. We were four hours before also. It's always been four hours.

MEMBER BROWN: No. I know that. Actual available.

MR. HAMMER: Oh. The limit for station blackout is acutally --

MEMBER BROWN: What would you actually expect from --

PARTICIPANT: What would reality be is what he's asking you.

MR. HAMMER: The battery capacity remains about the same. Actually, what we did do is we did do some additional analysis to try and enhance battery capacity. So, you know, you could contend that the battery capacity under EPU has slightly larger margins than it did at CLTP.

MEMBER BROWN: Let me ask the question another way. Before you went to the EPU, you had all the standard times, your limits, an audit statement saying, "Fine," but your actual performance if you were put into the situation has to have been longer

than even though you -- in other words, you --

MR. HAMMER: From a containment response, you know, the response is more significant, but from a battery capability response, which is the limiting component for this event, we actually have slightly more margin under EPU.

MR. SCHIMMEL: Let me ask you one more -- I'll ask something helpful here. Even though we were licensed of four, --

MR. HAMMER: Right.

MR. SCHIMMEL: -- we know we could go probably beyond four his question was.

MR. HAMMER: No.

MR. SCHIMMEL: Yes. That's what he's asking.

MEMBER BROWN: Yes. That's what I was asking.

MR. SCHIMMEL: That's what he's asking. What he's saying is reality will take you beyond four hours probably in some of these now that we have gone up, how much of that will pull us back towards the original four I think is what he -- it's a margin question. That's what he's asking.

MEMBER CORRADINI: And how much has the margin been reduced is what he's trying to get --

MR. SCHIMMEL: That's what he's asking.

MR. HAMMER: All I'm pointing out is the delimiting component was the battery. It remains the battery. And that hasn't changed significant. EPU actually has more --

MEMBER BROWN: Okay. But you're going to suck the battery down at a faster rate now than you did before. That's I guess what I am asking.

MR. HAMMER: No, no, no. Actually, what we have done is --

MEMBER STETKAR: You're running the same equipment.

MR. HAMMER: -- we have changed the battery loading to some extent. And we've changed our analysis, sharpened the pencil a little bit. We actually have more capacity in the battery now than we did for CLTP.

MEMBER BROWN: Okay.

MR. HAMMER: Here we are.

MEMBER BROWN: So you get compensated because you actually have more capacity. So you didn't lose margin on the battery.

MR. HAMMER: But we haven't changed. The four-hour coping period is very near the end, regardless.

MEMBER BROWN: You're going way past. That's fine.

MEMBER STETKAR: Steve, when you said you increased --

MEMBER BROWN: I got it.

MEMBER STETKAR: -- the margin on the batteries, is that by disconnecting loads? Is it by sharpening the pencil on battery?

MR. HAMMER: To a great extent, it was sharpening the pencil on how we did the analysis. What we have done is we have been able to actually reduce the HPSI cycles. We created HPSI for station blackout.

MEMBER STETKAR: Okay. Yes.

MR. HAMMER: So what we were able to do was show them we needed one less HPSI cycle.

MEMBER STETKAR: One less. I was just curious whether you did apply, you know, telling somebody to --

MEMBER CORRADINI: In all the ons and the offs in terms of procedures --

MR. HAMMER: Yes.

MEMBER STETKAR: -- shed one more light source or something.

MR. HAMMER: Yes. How we operate has

allowed us to show that we have an extra HPSI cycle.

MEMBER STETKAR: I understood your question.

MR. HAMMER: Okay.

MEMBER BROWN: And I understood the answer. Lots of sharp pencils around the room.

MEMBER REMPE: If there are no more questions?

MEMBER POWERS: A question that has nothing to do with power uprate but just equipment, can you flood the torus room?

MR. SCHIMMEL: Excuse me?

MEMBER POWERS: Can you flood the torus room?

MR. SCHIMMEL: Flood the torus room. The Monticello is designed to have -- you could put water in the torus room up to a certain elevation. And that as part of the original license requirements. And the assumption there is that you do have a containment failure or a torus room failure, but yeah, there is a limit in --

MEMBER POWERS: I raised the question because in looking at Fukushima, we are trying to understand the prolonged operation of RCIC. And our contention is they probably flooded, inadvertently

flooded, the torus room. They got the temperatures down. And so they didn't have a back pressure.

MR. SCHIMMEL: In Monticello, the RCIC and HPSI rooms aren't sealed, but the RHR, the corner rooms for --

MEMBER POWERS: Yes. It's the end light that was killing.

MR. SCHIMMEL: Yes.

MEMBER POWERS: The problem is RCIC operated too long --

MR. SCHIMMEL: Yes.

MEMBER POWERS: -- compared to what we expected. And so why did it? And so we think it's an inadvertent flooding of the torus room so that they could keep their feed pressures down. And so I ask it because, I mean, it looks like from an accident, we have got an interesting accident management strategy here.

MR. HAMMER: Okay. Any additional questions?

MEMBER BROWN: Yes. I have one other relative to the upgrade of your switchboard controllers that I didn't ask in the Subcommittee meeting because I didn't think about it. And when I said no access from your grid operator transmission,

system operator, you've got all these software-based controllers and the switchboards. Are they individual stand-alone controllers? I ask the question from if you have to make software upgrades, how do those get accomplished? Do you have to literally go down to the switchboard, open it up, connect in a laptop or thumb drive or something, or do you have some connection via a corporate bus that then runs in and you're bringing stuff in for your corporate engineering offices over the internet and down into the plants? And is that permanently connected or does it have to be executed on a manual control to actually allow access, if you can answer that question?

MR. STADTLANDER: Yes, you bet. We don't have a common bus. So we acutally have to go down to each relay in this point, plug in a laptop, and make the setting changes required.

MEMBER BROWN: Okay. So your control of access is literally, for those laptops and how you do that literally, maintained within the plant --

MR. STADTLANDER: Yes.

MEMBER BROWN: -- and the control room or something like that?

MR. STADTLANDER: Yes, yes. We have acutally got dedicated laptops to do that, have the

right software on it. Those are locked up, you know, and kept in a specific spot where only plant employees can get to it. And then we work through the engineering group as we need to in order to upgrade the setting files.

MR. SCHIMMEL: We control who does it also.

MR. STADTLANDER: Yes.

CHAIR ARMIJO: So it wouldn't be contractors coming in from a supplier that you don't know what's on there?

MEMBER BROWN: Well, the design stuff changes come in from -- they have got to get something from the guy who owns --

CHAIR ARMIJO: Right, but then you don't have a contractor coming in with his own laptop, his own staff.

MR. STADTLANDER: No. No, you don't.

MR. SCHIMMEL: I have to have operations oversight because it could be a reactivity change or something else.

MEMBER BROWN: Yes. Okay. All right.

MEMBER POWERS: One other question. When you bring on and you make this power uprate, you do a lot of stuff with your electrical. Does that have any

impact on your fire risk analysis?

MR. HAMMER: The impact on the fire risk was felt to be very minor. There is a section of our PRA that was provided to assess the impact on risk. And the impact on fire risk was felt to be small.

MEMBER POWERS: So you actually do a fire risk analysis, not a five analysis?

MR. HAMMER: It's not an 805-type --

MR. SCHIMMEL: We're still an appendix R plant.

MR. HAMMER: Yes. We're --

MEMBER POWERS: Say it again.

MR. SCHIMMEL: We're still an appendix R plant.

MEMBER POWERS: Yes. Okay. Good. I understand appendix R. But it didn't change. It's still in compliance and --

MR. SCHIMMEL: It stayed very small.

MEMBER POWERS: Okay. Have we been paying any attention to these arc faults?

MR. SCHIMMEL: Excuse me?

MEMBER POWERS: Have we been paying any attention to these high-energy arc faults issues that are coming up?

MR. SCHIMMEL: I guess I am not familiar

with that one. I'm not sure.

MEMBER POWERS: Get an arc fault. Let's see. HB Robinson fire and things like that.

MR. SCHIMMEL: I guess the largest impact that we had from appendix R is we did redo an assessment of the multiple spurious operations. So we didn't change the number of multiple spurious operations that we assessed from one to four.

MEMBER POWERS: Okay. Yes. I can see that.

MEMBER STETKAR: Is the 13.8 all new?

MR. HAMMER: Yes.

MEMBER STETKAR: Is that bused to the buses or why --

MR. STADTLANDER: It comes off the transformers on a bus dock, transitions to cables because of the length of the run, and then transitions back to the bus work when it gets down to the switchgear.

MEMBER SCHULTZ: One question. On the updates, margin improvement updates, associated with the program improvements, you indicated you did not only the evaluations, but you also brought it up to state-of-the-art standard evaluations. As you did that, any particular findings that you found

significant as you did the updates?

MR. HAMMER: You know, the significant issues that we found were just bringing, for example, again what I will use as an example, the procedures had changed a number of times over the years. And we found that there were a few scenarios that hadn't been considered in the limiting scenarios for MOVs. So we have corrected all of that.

All of the scenarios that we use for operating the plant now are covered in the MOV program high-energy line break. We substantially improved the program by -- we used to consider a lot of breaks as limiting breaks for different classes of breaks. So we analyzed one break for a reactor water cleanup, for example, and we have now done breaks, analyzed breaks at every location. So we've got an analysis for every break, crack now.

We have improved the, for example, high-energy line break. We improved all of the analysis to ensure that we're doing double-ended line break system depletion. We changed the analysis. We used to use limiting stroke times from the IST section 11 program for limiting stroke times for the MOVs. And what we are doing now is that we are using the USAR stroke times, which are longer than the IST

stroke times typically. We changed the profiles for isolation of breaks on the HELBs from being linear reduction of flow with valve closure to maintaining full flow until the valves are full flow.

So there are a number of changes, a lot of details, but, generally speaking, it was a more conservative approach or more comprehensive approach.

MEMBER SCHULTZ: Thank you.

MEMBER REMPE: If there are no more questions, we switch to staff.

MR. SALLMAN: Thank you.

Good morning, everybody. My name is Ahsan Sallman. I am the Senior Reactor Systems Engineer in the Containment and Ventilation Branch of NRR. I will go over the topic of containment accident pressure from Monticello EPU. First of all, we have these topics.

Go to the next slide. The next slide. The regulatory requirement is based on GDC-38 that the containment heat removal pumps and the ECCS pumps shall have adequate NPSH available for the performance, for the safety function performance. So that is derived from GDC-38.

For Monticello EPU, it was determined that --

CHAIR ARMIJO: Just a moment.

MEMBER CORRADINI: You're on slide --

CHAIR ARMIJO: Can't we get --

MEMBER REMPE: They're working it.

MEMBER CORRADINI: Just tell us the slide you're on.

MEMBER REMPE: He's on slide --

CHAIR ARMIJO: You're on slide 6?

MEMBER STETKAR: If you turn around and look behind you, you'll notice it doesn't look like what you're looking at on the computer.

MEMBER REMPE: So we do have copies. And so if we say he's on slide 8, perhaps we should just keep going.

CHAIR ARMIJO: Yes. Strange.

MR. SALLMAN: We have slide 8 here. For Monticello EPU, it was determined that the CAP credit is needed for the core spray and the RHR pumps. For the NPSHa determination, for the design basis LOCA, small steam line break, ATWS, and the appendix R event, it was not needed for an SBO.

And the SECY paper that was issued, SECY-11-0014, provided staff guidance in enclosure 1. And those were in sections 66-1 and 66-10 of this enclosure.

And what I'll do is I'll go over, on the next slide, number 9, I'll go over key items that were reviewed by the staff and evaluated.

The licensee performed a conservative DBA LOCA analysis using the conservative Super HEX code. That was the requirement in that SECY document. And then for the EPU, the licensee performed a statistical LOCA containment NPSHa analysis and the same using the conservative Super HEX code; the third item, the licensee performed a realistic LOCA containment NPSHa analysis using the best estimate GOTHIC code. The realistic inputs to the containment analysis were met 98 percent of the time in the plant.

It was found that NPSHa margin was increased when we compared the conservative and the statistical analysis. Statistical analysis is more realistic, close to the real conditions in the plant.

For the DBA LOCA analysis, the licensee used the uncertainty in the required NPSH. So the required NPSH was increased by including the uncertainty between the field conditions and the test conditions. And then we noticed that the required CAP credit in the realistic analysis was 70 percent of the CAP credit determined from statistical analysis. And it was 50 percent from the conservative analysis. So

this is like showing that the conservative analysis has a lot of margin in the NPSHa.

Another item in the SECY paper was to the licensee that used CAP to perform an online containment leakage monitoring test. And that was reviewed by the staff. And it was acceptable.

For the appendix R fire scenario, the licensee looked at the worst-case fire scenario, and it was determined that the containment integrity is maintained during that fire scenario. The licensee performed modification to preclude the multiple spurious operation and followed the NEI, the guidance in 00-01, revision 2, which was endorsed by our staff reg guide 1.189, rev. 2.

MEMBER STETKAR: Ahsan?

MR. SALLMAN: Yes?

MEMBER STETKAR: I thought when the licensee was discussing the question regarding the fire risk assessment, I thought I heard them say that they had evaluated four multiple spurious operations. It is my understanding that the guidance these days for appendix R plants doesn't limit the number of spurious operations. In other words, they should assume all possible spurious operations for each fire location.

I think there was recently a staff -- I don't remember whether it was an information letter or a request for -- I think it was a request for information from licensees because of large inconsistencies in the treatment of multiple spurious operations for plants that are applying reg guide 189 analyses. Could you speak to that a little bit? Do you know how many multiple spurious operations they actually evaluated in their analysis? And if they did not evaluate all possible multiple spurious operations in each fire zone, would those additional multiple spurious operations result in conditions that could jeopardize containment integrity and, therefore, the NPSH analyses. It's a long question.

MR. SALLMAN: Yes. Well, there were four, a maximum of four, multiple spurious operations. I think --

MEMBER STETKAR: Okay. What is the basis for that from the staff's perspective? I will ask you first.

MR. SALLMAN: I think that -- I am not sure of that. I think if you can --

MR. HAMMER: Steve Hammer from Monticello. We did look at all of the possible flow paths out of the containment. We looked all of the possible

spurious operations of things such as pumps. And we did assess the worst combination of all of those. So you could say that we looked at all possible spurious operations. However, the assessment only considered four MSOs, or multiple spurious operations, happening simultaneously. So we looked at, I believe, 17 cases of combinations with any four MSOs happening simultaneously.

MEMBER STETKAR: That's what you did. I'm going to ask the staff why given the current request for information and the guidance -- at least that's the way the staff has interpreted it in the Fire Protection Branch -- Y-4 is good enough.

MR. SALLMAN: The guidance in NEI 00-01, rev. 2, is the latest guidance that we have.

MEMBER STETKAR: Reg guide 1.189, though --

MR. SALLMAN: 1.189 --

MEMBER STETKAR: -- doesn't limit it. If I recall, there's no specific limitation. And it cites experience showing, prior test experience shows, no basis for the number of --

MR. SALLMAN: Yes. The maximum for multiple spurious operations that were the bounding ones in this application, there were like actually

pumps, operation of pumps that dump heat into the suppression pool. And the cooling of the suppression pool was considered -- the venting of the containment because of the appendix R fire was evaluated. And all of the requirements in NEI 00-01, appendix G, I guess, they were considered. So that was the latest guidance as far as I know.

MEMBER STETKAR: But they did indeed --

MR. SALLMAN: The maximum four were considered dumping heat into the suppression pool and cooling --

MEMBER STETKAR: I'm more interested in isolation, whether there were any conditions where you could --

MR. SALLMAN: In isolation?

MEMBER STETKAR: The old containment isolation and, therefore, depressurize the drywell.

MR. SALLMAN: Yes. They were all --

MEMBER STETKAR: That's my bigger concern.

MR. SALLMAN: Yes. All those conditions given to NEI 00-01 for BWR, they were considered. And they were looked at.

MEMBER STETKAR: The appendix G type?

MR. SALLMAN: Appendix G. And there was some plant modification sampled, to preclude the

containment failure, containment isolation.

MEMBER STETKAR: Thanks.

MR. SALLMAN: Yes. No new operator action in the new CAP.

MEMBER RAY: On that point, was there anything that you would think of as the operator actions aren't a new action but they're more challenging for any reason, timing-wise or --

MR. SALLMAN: I didn't find any new operator action in the analysis.

MEMBER RAY: Well, I understand that. I guess I am just trying to figure out is --

MR. SALLMAN: If there is any more new challenging --

MEMBER RAY: Were the operator actions, although they were the same, more challenging for any reason?

MR. HAMMER: Steve Hammer from Monticello. No, we didn't have any changes in time-critical operator actions either. So the way the assessment was done, there were no changes in the actions or in the time to do the actions.

MEMBER RAY: Yes. Okay. I was just thinking about things like trying to maintain the pressure in a more narrow band or anything of that

kind.

MR. SALLMAN: One of the issues that was pointed out in the SECY paper enclosure 1 was the operation of the pumps, ECCS pumps, and the containment heat pumps in the zone of maximum erosion, which was pointed to us by our consultant, pump consultant. And that was in the range of NPSHa between 1.2 and 1.6.

And the pump vendor, Sulzer, was consulted by the licensee. And there was nothing reported negative on that operation between 1.2 and 1.6. So this issue was satisfactorily addressed by Sulzer.

MEMBER SKILLMAN: Ahsan, what do the 1.2 and 1.6 refer to?

MR. SALLMAN: Okay. I am sorry. There is an error here. "NPSHa ratio" should be "margin."

MEMBER SKILLMAN: Thank you.

MR. SALLMAN: This is NPSHa ratio, --

MEMBER SKILLMAN: Thank you.

MR. SALLMAN: -- which is the ratio of NPSHa and NPSHr, which is a requirement for NPSH. So that is an error in this slide.

MEMBER SKILLMAN: Thank you.

MR. SALLMAN: The last item in this slide is pump mission time for DBA LOCA and non-DBA events

until the CAP credit is not needed was evaluated. And the results were accepted.

MEMBER CORRADINI: What was -- I've forgotten or maybe it's in the next slide. Oh, here it is on the next slide. Never mind. Excuse me.

MR. SALLMAN: This slide gives what are the CAP credits, what are the CAP credits for the bounding core spray, what was the bounding. And these are the CAP credits for ATWS appendix R and two cases of appendix R.

MEMBER REMPE: So this maximum CAP credit number of 9.1, that's larger than -- wasn't the Super HEX evaluation I saw on the licensee report 8.6? And so what is that value corresponding to?

MR. SALLMAN: Maximum CAP credit as given in the licensee's CAP submittal is 9.1. That's the maximum value. And the CAP available is the next column, which is -- this is from the licensee's document.

MEMBER REMPE: I may have a question offline for you.

MR. SALLMAN: Okay.

CHAIR ARMIJO: Now, there was testing of the pumps, right, to evaluate their capability to perform without damage?

MEMBER RAY: Without damage, yes.

CHAIR ARMIJO: Yes. What was the duration of those tests?

MR. SALLMAN: As far as I remember and as reported by Sulzer, the factory test that was done as low as the NPSH-required five percent. And that five percent represents the dynamic head drop at the same flow as that test at that point. So the institute, Hydraulic Institute, requires three percent. And our NPSH-required is upgraded from 3 percent dynamic head drop plus 21 percent or plus uncertainty.

CHAIR ARMIJO: Yes. And what was the duration? I remember seeing a number, large number of hours, but I don't remember what the number was.

MR. SALLMAN: I think it's in one of the reports.

MR. HAMMER: Steve Hammer from Monticello. There was actually a number of different tests that were looked at. They were like typical factory tests that do potentially go down as low as full collapse. But those test points are typically less than about ten minutes. And what you are doing is you are demonstrating. You know, we are never really approaching those values. But it does demonstrate that the pumps are robust, even with much larger

values.

There was also some testing that was done at a number of different plants that we looked at, some tests that were done in Canada, in Europe, and at Dresden and Quad Cities. And some of those tests went for longer periods of time but nothing on the order of hours. So it was typically minutes.

CHAIR ARMIJO: Well, there was nothing tested on the order of 126 hours, right, or there was?

MR. HAMMER: Yes, but this shows that we're meeting NPSHr-effective or the uncertainty of requirements for three percent for that time period. And what Sulzer did is they showed that they could demonstrate pump reliability over the full mission time with events that were more challenging for us.

CHAIR ARMIJO: Okay. Thank you.

MR. SALLMAN: So the next slide is the conclusions. The staff's conclusion is the CAP credit, CAP is credited to NPSHa for the core spray and the RHR pumps, for DBA and non DBA events. Conservative LOCA analysis is the licensing basis analysis, even though the licensee performed the statistical and the realistic analysis. But even then, the conservative analysis is the licensing basis.

Staff guidance in the SECY paper in enclosure 1 was satisfied. The staff considers the use of CAP in the available NPSH as acceptable. And we did not see any comments from the Power Uprate Committee, Subcommittee.

That's the concluding slide. If there are any questions?

(No response.)

MEMBER REMPE: Next presentation?

CHAIR ARMIJO: That will be a closed session.

MEMBER REMPE: Okay. So we need to switch to a closed session at this point.

(Whereupon, the foregoing matter went off the record at 9:31 a.m. and resumed at 11:26 a.m.)

MEMBER REMPE: We're back into open session. I know Dennis had some additional information that you wanted to present, right?

MEMBER BLEY: And I don't want to present. I am a member. I have questions.

MEMBER REMPE: Yes.

MEMBER CORRADINI: You don't have to defend anything. You just get to attend.

MEMBER REMPE: There's something you wanted to attack.

MEMBER BLEY: I hadn't been at the Subcommittee meeting. So this is my first exposure. And the issue John brought up earlier about multiple spurious operations, I looked back at the reg guide just to check for myself. And there's a little history. A previous version of the reg guide came out and referred to, in fact, the new one refers to, RIS 2005-30, which requires that all multiple spurious conditions have to be protected for appendix R plants.

The new version of the reg guide, rev. 2, essentially says the same thing except under certain peculiar conditions. So I am very confused about the statements we heard from staff. In fact, the reg guide specifically says NRC has not fully endorsed NEI 00-01, specifically the areas with regard to multiple spurious operations, and then gives some criteria.

So just saying they used the NEI report without the conditions that are specified in the reg guide doesn't seem to meet the guidance. And I am curious about why staff has said that is okay.

MEMBER REMPE: So we may not have the staff reviewer that was over the CAP portion here. So I'm not sure if they can respond at this time. If the licensee has any response, that would be great. Otherwise we may have to wait until letter writing to

get a response from that.

MEMBER BLEY: I guess.

MEMBER REMPE: Terry, is there anything more that you want to say other than that we'll have to get back?

MR. BELTZ: No. We'll just have to get back. I'm trying to get a hold of the reviewer right now.

MEMBER BLEY: But it's right in the reg guide. Section 5-3 of the reg guide is the place, rev. 2.

MR. BELTZ: What reg guide is that?

MEMBER STETKAR: 1.189.

MR. BELTZ: 1.189?

MEMBER STETKAR: It is sort of the deterministic part of what used to be appendix R fire analysis and its comparison to apply --

MEMBER BLEY: It gives you some probabilistic options.

MEMBER STETKAR: -- which is the NFP 805 sort of incarnation of it, this 1.189.

MEMBER POWERS: This particular issue was a fair brouhaha 15 years ago, some time ago.

MEMBER BLEY: Yes, 2005 is when they responded to --

MEMBER POWERS: And the reg guide reflects the position staff held throughout that and the position that the ACRS subsequently endorsed.

MEMBER STETKAR: It's just there may be an analysis that winnows it down to why four and only four are important, but it's curious, you know, whether the staff really looked at that and, in particular, because it's not a core damage issue necessarily in the PRA if they have a fire PRA. It's a containment isolation issue, which if you just have a little one internal event PRA, those things might not even be modeled in the PRA. So in terms of if they have PRA arguments, it's not clear.

MR. BELTZ: We'll get that information.

MEMBER BLEY: Okay. Thanks.

MEMBER REMPE: Does anyone have any other questions related to this topic?

MEMBER POWERS: I'm not sure how to ask question. And it certainly doesn't have anything to do with the review, but it does have to do with research. This issue of vibrations and internals, of course, caught us by surprise when Quad Cities came in for its power uprate. We have now been through several of these. And I am wondering why the NRC staff does not have available to it tools that allow

these vibrational analyses to be done just as a routine thing. And I'm wondering if this is not a subject to raise in connection with our research report.

MEMBER REMPE: We are going to be discussing that this week. So the cognizant person is aware of it.

MEMBER POWERS: Yes. I mean, in general, you know, things happen and surprise us in the course of regulation in these plants. But if they are going to be recurring things, it seems to me that the line organizations should have available to them tools that allow relatively straightforward analysis by this time.

I mean, Quad Cities was quite a while ago. Weigh in, Terry, if you have an opinion on this.

MR. BELTZ: Yes.

MEMBER POWERS: I mean, the job these guys have reviewing these applications is hard enough not to throw barriers in them just because we don't have tools to do things we know we're going to have to do. And we know that every BWR that comes down the pike somebody is going to ask this question about vibration of the upper internals. So, I mean, by this time, we may be able to do them by intuition. Tools,

nevertheless, seem to me to be an important thing to make available. These things are hard to analyze.

MEMBER REMPE: There is a person behind you, I believe.

MR. McMURTRAY: Can I ask a --

MEMBER REMPE: You need to state your name. Okay?

MR. McMURTRAY: Tony McMurtray with Civil and Mechanical Branch in Division of Engineering in NRR. My question is, are we talking about general internal vibrations or are we asking specifics with regards to steam dryers and the acoustic vibration? Because we have had this discussion internally about why we go out and get Argonne to do the reviews that we do with regards to the acoustic vibrations versus just other general internal vibrations. So I'd like that clarification from ACRS.

MEMBER POWERS: This ACRS member cannot give you that clarification because he doesn't know the answer.

MR. McMURTRAY: Okay.

MEMBER POWERS: He is saying we have had the questions on vibrations since Quad Cities. And we will always have questions about vibrations on these BWRs. We may have questions about PWRs as well, but

we know we will have them. And I'm wondering why we don't have tools available to us to analyze these as a matter of routine.

MR. McMURTRAY: Yes. The only thing I can add to --

MEMBER POWERS: It's not your fault.

MR. McMURTRAY: No, no. Well, because I have had this discussion with my management in-house with regards to why we don't have someone who can do acoustics. And I can bring Pani back up, but what I understand is there is unique analysis that needs to be done with this that really only -- in fact, there are very few places in the world that can do it. Argonne is one of them. And that is why we contract out to Argonne to look at these acoustic vibrations.

Now, other things we may be ale to develop the tools in-house, but, in fact, my management has asked, why don't we just send Pani back to school to get him smarter?

(Laughter.)

MR. McMURTRAY: And I argue that that is probably not most cost-effective for the agency, but that is why I am asking the specifics on the question, because the acoustic analysis we do think is unique and is something that we need to go out and get that

kind of expertise. And trying to develop it in-house or gather that in-house we don't think is the best expenditure of agency resources. But for other vibrations I am open to what ACRS would suggest.

MEMBER POWERS: Well, I mean, I think that would be a very good answer for somebody to come back and say, "These areas are at the state of the art" and perhaps go a little beyond that. So a routine tool will never be developed for it. But, I mean, I think it's a question to ask the Research organization. I don't think, I mean, you're the victim, you know.

MR. McMURTRAY: Well, no. That's fine. I mean, we have had this dialogue with Research, and I think that is why we understand. And, in fact, I have to go out and fight for contract money to make sure we can still pay these guys to go do this work. But that's why we go out to get contractors and get specifically Argonne to do this work for us with regards to acoustic vibrations.

MEMBER BANERJEE: Could I try to understand what you mean by "acoustic vibrations" here? Is it the solution to the Helmholtz equation?

MR. McMURTRAY: I am bringing Pani. Go ahead.

MEMBER BANERJEE: What is it you are

talking about?

DR. BASAVARAJU: Flow-induced vibrations essentially from the SRV standby presence. And when passing frequency vibrations, that --

MEMBER BANERJEE: I am just trying to understand what it is in concrete terms. Are you solving a 1D Helmholtz equation in the pipe and at 3D in the dome and in the thing or what is it that you are trying to do? Can you tell me that?

DR. BASAVARAJU: Helmholtz equations.

MEMBER BANERJEE: They govern the waves only.

DR. BASAVARAJU: Right. The wave equations. And the Helmholtz is a 3D solution within the dome. That is what ACM, this tool used by licensee for evaluating, was a type of vibration at that --

MEMBER BANERJEE: Why is that a --

CHAIR ARMIJO: That's a proprietary tool, right?

MEMBER BANERJEE: I mean, it's a linear equation. It's not even the Stokes. So presumably somebody at NRC can solve them, right?

DR. BASAVARAJU: Yes. Yes.

MEMBER BANERJEE: So I guess Dana's

question is, why isn't this capability there in-house because it arises on a number of occasions -- it's not just for this case -- or some confirmatory work?

You're saying that the only place that can do this is Argonne? I find that very hard to believe.

MEMBER CORRADINI: The only ones they probably have on contract when they can go --

MEMBER BANERJEE: Oh, okay.

MEMBER POWERS: I mean, Argonne obviously does a very good job for them --

MEMBER BANERJEE: That's fine.

MEMBER POWERS: -- and whatnot, but, you know, where we can identify things that would make the life of the line organizations easier, we should try to do that, it seems to me.

MR. MONNINGER: So this is John Monninger from the staff. There is a related issue. And I wouldn't have any insights on it, but there is a related issue to it. Not only is it the specific technical area, but it is also the volume of work. And I cannot speak for the volume of work we have within this area, but to have staff on board, you would need a sufficient volume of work to keep them fully employed throughout the years and to make sure that there is career progression in there.

And I can't say what the specific volume of work is, but we do have critical skills across the agency. And we assess the incoming work. And over the years, we have varied the level of staffing for those critical skills.

I'm not sure if that helps. I mean, there are areas that come up that we don't have enough work volume to necessarily justify what we call a full staff, FTE, a full-time equivalent. I can't say that's in this area or not, but it's two different considerations. One is the expertise and then the volume of work that comes in to address that. Does that make sense?

MEMBER POWERS: That, of course, is an excellent point, John, but --

MEMBER REMPE: I would like --

MEMBER POWERS: -- we distinguish between the technical issues and the management of the agency and we don't try to manage the agency. And if the response to the question was just what you said, we don't have a sufficient volume of work to justify it, you know, fair enough. Accept it.

MR. MONNINGER: But I'm not saying we don't have a sufficient amount of --

MEMBER POWERS: I know you're not giving

the answer. Nor am I asking you for the answer.

MEMBER REMPE: I'd like to ask one other question and shift topics real quick. What didn't come up today was the fact that there is a companion license amendment request that will be hopefully coming soon to ACRS related to the MELLLA+ because this plant will not actually go to the requested power the way it is currently envisioned unless the MELLLA+ license amendment request is granted. And I would like the Branch Chief to respond to what he estimates that time that will come to ACRS is.

MR. MONNINGER: So thankfully I'm not the Branch Chief.

(Laughter.)

MR. MONNINGER: I'll defer to Terry. The MELLLA+, what are our predictions for wrapping up the review of MELLLA+ and fully engaging the ACRS?

MR. BELTZ: A lot of it right now is dependent on some questions that we have out with the licensee right now. The turnaround on those should be very quick. But the problem is now trying to get a draft safety evaluation n its entirety one month prior to the subcommittee meeting, which was originally scheduled for this November, November 5th. And as far as the turnaround time, getting the information from

licensee and the staff, performing the review of that response, and then developing and completing their safety evaluation, I mean, if Chris can talk to that?

MR. JACKSON: Good morning. I guess we still have 15 minutes in the morning. My name is Chris Jackson. I'm Chief of Reactor Systems Branch. So I'm responsible for this review.

We made a huge amount of progress in the last several months. We have found an error in the four calculations of the ATWS high transient. We resolved that issue. They provided us with the results two and a half weeks ago for the new calculations, but they haven't provided us a complete analysis. The safety analysis that was submitted with the MELLLA+ application hasn't been updated. So that is the information we are missing.

And with the application two and a half weeks in hand, we are satisfied technically with the issues we are still resolving. We are still reviewing the last issues, but we don't see any show-stoppers. But what we're missing now is a revised safety analysis that would include the new ATWS high transient, which is quite a bit different than it was before with the model that was in error.

So we are very close. I don't think I

will have an SER. I am next, in less than a month. I can commit to two months to get an SER, but we still have to have a little bit of interaction with the applicant.

MEMBER REMPE: I'd like to remind everybody here that we don't have a full Committee meeting in January. So if you wait until December, it will be February before it would ever come to full Committee, just so everybody knows the rules of the game here. Okay?

MR. JACKSON: I can provide an SER. By next month, I can provide an SER, but there is still a potential for a few open items. I don't expect that to be large.

MEMBER REMPE: Okay. Well, just so everyone is aware of it. And we discussed the agenda tomorrow at our planning meeting. So if anybody has any insight, if you could provide them?

MR. JACKSON: Right. I spoke to the applicant. And they said --

CHAIR ARMIJO: But it does sound like there is going to be a slip.

MEMBER REMPE: It does sound that way to me, too. We have got everybody here. That is why I brought it up.

CHAIR ARMIJO: Yes. Thank you.

MR. JACKSON: Did I answer your question?

MEMBER REMPE: You did. And if there aren't any other questions, I would like to turn it back over to the Chairman a little bit behind schedule.

(Laughter.)

MEMBER STETKAR: Way to run the meter.

MEMBER REMPE: It wasn't my fault.

CHAIR ARMIJO: Joy, you did not ask for public comments. You've probably got to do that and the bridge lines.

MEMBER REMPE: You're right. I'm sorry. I thought that was the Chairman but okay. So are there any comments? Peter, can we open up? It's open, right? But they're not on mute, right? So is there anyone out there? Could you please speak so we know it?

DR. SMITH: Kord's here.

MEMBER REMPE: Okay. Do any of you have any comments you would like to raise?

DR. SMITH: Not at this time.

MEMBER REMPE: Okay. With that being said, I think we can now turn it back over to the Chairman.

CHAIR ARMIJO: Okay. Thank you.

Well, I would like to apologize for the huge delay and interruption, but we had no --

MEMBER POWERS: It was Terry's fault.

CHAIR ARMIJO: We had no say on that. And I think what we need to do now is let's convene. Let's go to lunch and then come back at -- let's try and do it at 1:00 o'clock. Yes, we might as well. And then we'll start late on John's topic. So let's go to lunch. Thank you.

(Whereupon, a luncheon recess was taken at 11:45 a.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

CHAIR ARMIJO: Okay. We're going to reconvene. I apologize for the delay in getting started. Our next topic will be the Risk-Informed Regulatory framework for new reactors, and Mr. Stetkar will lead us through the presentation.

MEMBER STETKAR: Thank you, Mr. Chairman. I'll probably keep the info brief so we can make up a little time maybe. We had a Subcommittee meeting on this topic on July 22nd. The topic is a draft, and I don't know whether it's a SECY paper yet.

MR. FRAHM: It will be.

MEMBER STETKAR: It will be. In response to Commission SRM on SECY-12-0081 I think it is, I tend to forget numbers, regarding improvements, changes to the reactor oversight process for new reactors. And the Members will recall we've written a couple of letters on the topic, and the Staff is preparing a paper for a Commission vote on proposed options.

One thing I need to alert the rest of the Members to is that we -- in our package for this meeting, we have the version of the draft paper that was issued in June, and I've forgotten the date, of this year. It was before -- it was for our Subcommittee meeting. It's my understanding that

you've gotten -- you've received some feedback from public comments, from meetings, and I've been told that you've made only minor changes to the paper. We've not seen --

MR. FRAHM: Right, we're in the process of making those changes. We'll talk about that in our presentation.

MEMBER STETKAR: We'd be, obviously, especially interested if there's anything substantive, minor editorial comments. So with that I guess, I don't know, Ron, or Vinny, or Allen. Thank you. I'll turn it over to you.

MR. HOWE: All right. Thank you and good afternoon. You hit on a couple of the points that I was going to mention, so in the interest of time I won't get into those, but I will emphasize the fact that this paper is being jointly developed by staff from both the offices of NRR, as well as the Office of New Reactors.

In addition to that, I think as you mentioned we have had public interface. We actually had several interactions with the public before we issued the draft paper, and then we actually had public comment on the draft paper in August of this year. And as you mentioned, we did brief the

Subcommittee back in July, so with that, let me turn it over to Ron so hopefully we can catch up a little bit. Thank you.

MR. FRAHM: All right. Thank you, Allen. My name is Ron Frahm. I'm in the Division of Inspection and Regional Support in NRR.

The purpose of today's briefing is to discuss the draft paper on risk-informing the reactor oversight process for new reactors. And as John mentioned, I'd really like to focus on the summary of the changes that we've made to the draft based on more recent feedback.

I do have the lead for this effort, but I've had a lot of great help from several people; Eric Powell at the table here from the Office of NRO has had the lead really in the relative risk approach discussion. Mike Balazik has had the lead in the appropriateness of the performance indicators portion of this effort, and Jeff Circle from the Division of Risk Assessment has the lead for the integrated risk-informed approach using qualitative measures portion. And as you can see, unfortunately, Jeff was unable to join us today. He had a prior commitment so I'll actually be wearing two hats. I'll cover my portion as the lead, as well as the integrated risk-informed

approach portion.

We do have a lot to cover today, and I do understand that industry doesn't have prepared comments or slides, but they would like a little bit of time at the end of the meeting.

MEMBER STETKAR: And, by the way, we'd like to try to catch up time on schedule but since most of the Committee has not heard this presentation, you have an hour and a half on our agenda.

MR. FRAHM: Right.

MEMBER STETKAR: So, don't --

MR. FRAHM: And we did try to pare it back significantly, obviously, from what we presented to the Subcommittee, but we tried to leave enough meat on the bone to give the --

MEMBER STETKAR: And it's important to -- for the rest of the Members to hear what you have to say.

MR. FRAHM: Okay, great. And we will conclude our portion of the presentation today with a summary of our conclusions, the recommendations that we plan on putting forth in the paper, as well as a summary of what we believe are the most significant changes to the draft paper based on the recent feedback.

As John mentioned, over the past several years the staff has interfaced with the Commission and the ACRS multiple times regarding this topic. And most recently, as we have on the slide here, and John mentioned, we sent up a SECY paper last June. It provided recommendations for both the oversight process that we're here to speak of today, as well as the licensing process. We have run a series of tabletop exercises, and based on these exercises we concluded that the current risk thresholds were appropriate that are in the existing ROP as applicable to new reactors; however, a few changes may be warranted consistent with the integrated risk-informed approach of Reg Guide 1.174, and we recommended Option 3B which was to augment existing risk-informed ROP tools with deterministic backstops to insure an appropriate regulatory response. And, of course, the ACRS wrote actually two letters that recommended a fourth option that would incorporate a relative risk approach.

The Commission SRM as a result of the paper came down in October of 2012. I don't need to really read through all this, but I did want to point out that they asked us to give additional consideration to the use of relative risk, and really

to provide three main things in our response back to the Commission and in a Notation Vote paper, and that is a technical basis for our proposal to use deterministic backstops and include some examples. They asked us to do a technical evaluation of the use of relative risk measures, including a reexamination of the pros and cons that had been previously put together back in 2009, as well as a discussion of the appropriateness of the existing performance indicators and their thresholds for new reactor applications.

You'll note in our presentation today and in the draft paper that we're now using the term qualitative measures instead of deterministic backstops because we think it just more accurately captures the intent of the proposal that we had in last year's paper, as well as our discussions in the current paper.

The approach on the next slide, we did send the draft to the ACRS and made it publicly available in June. It was a draft of a Notation Vote paper that is due up to the EDO in October. We have involved industry and ACRS and public, several internal and external stakeholders. We had the ACRS Subcommittee meeting in July, three public meetings prior to the development of the paper that informed

the paper itself, and then we had a public meeting to discuss the draft paper on August 5th.

One of the challenges was to stay within the scope of the request, and that was just to provide the technical basis and discussion, and not to try to fully develop what this integrated risk-informed approach might look like, specifically. We wanted to provide a crisp paper, but it did need to have enough detail to give the Commission what they need to direct us accordingly, so we have a basic main body of the paper with supporting details and four enclosures. And there were two other pieces to that SRM in October, and that was the history of the large release frequency, and an independent review of the reactor oversight process, but those are outside of the scope of this effort.

So, the outline of the SECY paper, as I mentioned, we have the summary conclusions and recommendations in the front. The first enclosure has a background and history of correspondence between the staff and the Commission, the public and the ACRS. The second enclosure is the technical basis and examples of an integrated risk-informed approach using qualitative measures. The third enclosure is the technical evaluation of the relative risk measures,

and the reexamination of the pros and cons that Eric will speak to. And the fourth enclosure is a discussion of the appropriateness of the existing PIs and their thresholds that Mike will speak to.

I have a few pictures here to basically give a little bit of background on the ROP and its framework. We do have seven cornerstones in the ROP. They're across the third level there of cornerstones. The main cornerstones that are risk-informed that we're really focused on in these discussions are the first three of initiating events, mitigating systems, and barrier integrity, while the next four are a little bit more deterministic. It's really all I wanted to point out on this slide.

And we use performance indicators and inspection findings to evaluate and assess licensee performance to insure that all the cornerstone objectives are met within each of those seven cornerstones. Then we apply thresholds to determine the significance of the findings and performance indicators. And for the greater than green findings and indicators, they are equally weighted across the cornerstones, and we use an action matrix to determine a reliable and predictable regulatory response. That's what I really wanted to show on this slide.

And then in performing our evaluations we did carefully consider both the principles of good regulation and the goals of the ROP to make sure we were consistent with these guiding principles. Probably most notably we believe our recommendation is clear, efficient, and reliable, predictable, and, of course, risk-informed. We'll talk about that a little bit more as we go forward.

Now I'll turn it over to myself to talk about the technical basis and examples of an integrated risk-informed approach using qualitative measures. Really our objectives and considerations in the development of this conceptual approach were to produce a methodology that represented one possible way that we could develop and use a qualitative approach to -- in an integrated fashion to determine the significance of inspection findings.

As I mentioned, we changed the term to qualitative measures because we felt it was a more accurate depiction. The concept needed to be easily understood and have a traceable technical basis. The approach should be conceptual in nature and as an illustrative example, and that was perhaps the most significant feedback we received from both the ACRS Subcommittee and industry was that it could be

perceived from the way the draft was written that we were proposing and asking for Commission approval to use the approach that was in Enclosure 2, when actually that was just an example of what an approach might look like that we're looking for them to --

MEMBER STETKAR: Is the -- and you'll probably get to this in the closeout slides, but just so I can start thinking about it a little bit. Are those examples going to be retained in the final version of the paper?

MR. FRAHM: They are, but we will verify repeatedly that they're conceptual, et cetera.

MEMBER STETKAR: I think we understood that. I'm curious -- anyway, here --

MR. FRAHM: In reading through the paper I could see how that perception was there, that we were asking for approval to go forward with that specific approach.

MEMBER STETKAR: There's certainly a danger the way it was written, but you need that level of detail to illustrate how the process --

MR. FRAHM: We've actually used examples.

MEMBER STETKAR: That's right.

MR. FRAHM: That was the balance that we have been struggling through for months, so we do

think it's at about the right level now.

This approach could potentially be applied to the existing operating fleet as well as the new reactors. And it is consistent with the Near-Term Task Force Recommendations 1 and 2 to have a coherent framework that appropriately balances defense-in-depth and risk considerations. And, of course, our efforts will be coordinated with their efforts as we go forward to insure consistency.

Using qualitative factors along with risk insights in an integrated fashion is consistent with the current NRC decision making processes, and the ROP basis; probably most notably, Reg Guide 1.174, as well as the PRA policy statement, and some of the founding documents of the reactor oversight process. There's others listed there, I don't plan on going through all of them.

In the development of the concept, the ROP and the SDP, in particular, is a risk-informed process used to evaluate licensee performance deficiencies in order to determine an appropriate regulatory response, and allocate inspection resources. It does have a quantitative core damage and large early release frequency aspect to it, as well as a qualitative aspect. It is a risk-informed process, and those

should be considered together to arrive at a determination.

The quantitative measures of the SDP are well defined in Appendix A to IMC-0609, but the quantitative measures are not nearly as well defined, and not as structured in their approach.

MEMBER STETKAR: You said quantitative -- qualitative measures.

MR. FRAHM: Qualitative on the second portion of that. Right. If I said quantitative, I apologize. The quantitative is defined in Appendix A, the qualitative is used more infrequently in a less structured manner primarily in accordance with Appendix M to IMC-0609.

MEMBER STETKAR: You don't have a slide -- yes, you do. No, you don't.

MR. FRAHM: That's shows the SDP --

MEMBER STETKAR: That shows the current quantitative measures.

MR. FRAHM: I had that in the Subcommittee presentation.

MEMBER STETKAR: Okay.

MR. FRAHM: I actually took it out of this one.

MEMBER STETKAR: That's fine.

MR. FRAHM: But it basically does say just that, that IMC-0609 Appendix A is used as the quantitative risk-informed approach for the three risk-informed cornerstones. And that Appendix M is used on as-needed basis when we don't have enough information to make a informed decision using Appendix A. That was really the gist of that slide.

MEMBER STETKAR: Just for -- and I think we asked in the Subcommittee meeting, but again for the benefit of the other Members, and recognize that the ACRS traditionally has not been as deeply involved in the reactor oversight process as some other aspects of plant licensing and analysis, so that the -- I think the general familiarity among Members about how this process works in practice today anyway is perhaps not as crisp as some of the other activities that the Agency engages in.

In practice, something happens. How does the staff currently develop the significance of that? And I don't need a long, involved process. I'm looking at what does the staff do? What does the licensee do?

MR. FRAHM: Well, that would come out of an inspection finding, so during an inspection we would discover a performance deficiency. We would document that in the inspection report in accordance with

Manual Chapter 06-12, and then we try to determine the significance of that using our significance determination process which is described in IMC-0609, and our several different appendices to IMC-0609 depending on the specific area of the performance deficiency. The main one we're talking about is the risk-informed portion which is in Appendix A.

So, primarily it's more quantitative at least in a structural fashion than qualitative, so they go through and crunch the numbers and come out with their risk number.

MEMBER STETKAR: Okay. "They" being --

MR. FRAHM: They as in --

MEMBER STETKAR: The Region --

MR. FRAHM: Typically, the regional Senior Reactor Analyst --

MEMBER STETKAR: Using the available SPAR model for that plant.

MR. FRAHM: In a program I believe that's called SAFIRE --

MEMBER STETKAR: Yes. But it's --

MR. FRAHM: Personally, I've never used it.

MEMBER STETKAR: No, it's a -- I've tried. Now, what does the licensee do? Does -- I've heard that the licensee often will run the same thing

through their in-house tool.

MR. FRAHM: Right.

MEMBER STETKAR: Right, I was going to say PRA model, but tool is probably better.

MR. FRAHM: They often do.

MEMBER STETKAR: And if there is a disparity, large numerical disparity, not -- such that you're in a different color range let's say, what happens then?

MR. FRAHM: Actually, I will let Rani handle that.

MS. FRANOVICH: I can answer that question. Rani Franovich, NRR staff.

Just to go back one step, when there is one of the first three cornerstones involved in the performance issues, that would be the initiating events, barrier integrity, and mitigating systems, then the risk analysts get involved. And there is a regulatory conference with the licensee where they provide information that we use to inform our final significance determination.

There are four other cornerstones where we really do not use PRA much at all. We use just the qualitative determination process.

MEMBER STETKAR: I was just trying to probe

a little bit in terms of the areas where you do use it, because I know it is used quite a bit.

MS. FRANOVICH: Right. And when it comes to getting information from the licensee, sometimes it comes down to differing modeling assumptions.

MEMBER STETKAR: Okay.

MS. FRANOVICH: So, we just kind of work through which ones are the most plausible to come to the final significance determination.

MEMBER STETKAR: Okay, thanks.

MR. FRAHM: Thank you. Okay, so where are we, Eric?

MR. POWELL: Go to the next slide?

MR. FRAHM: Yes, I think so. So, we developed a conceptual integrated risk-informed approach to integrate both the qualitative and quantitative measures in a more structured fashion. We developed a set of qualitative elements to model both degradation and potential credit given to licensees. We then rated the level of degradation or credit of these elements through a structured framework that is presented in Enclosure 2 to the paper.

The intent was to promote clarity and traceability of decision making, and to avoid double counting some qualitative measures that might already

be accounted for on the quantitative side. And the intent is to arrive at a single qualitative rating that considers all of these selected qualitative measures, at which time we would combine these ratings together with the quantitative result using an integrated framework, and then use a table or some other method to arrive at a color band assessment which is demonstrated on the next slide.

As you see here, the more PRA aspect portion of it is over there on the right side, my right anyway, the right side there which is our traditional PRA approach using quantitative measures. That has not changed in our proposed approach. What we're proposing is to add a second layer which is the qualitative risk evaluation that would take into account those measures that are not very well accounted for potentially on the quantitative side, and then arrive at an integrated risk-informed approach to come up with our color rating.

And if you'll notice there in the determination table we changed the titles, John, I don't know if you can see there or notice to neutral impact, reduced impact, increased impact, and significantly increased impact based on feedback from both the Subcommittee and others.

MEMBER STETKAR: I'm a color guy.

MR. FRAHM: Well, it was very confusing the way we had them labeled prior.

MEMBER STETKAR: I didn't even remember how they were labeled.

MR. FRAHM: Yes, I think moderately degraded was our neutral impact line.

MEMBER STETKAR: Oh, yes, yes, yes. Yes, yes, yes.

MR. FRAHM: Which didn't make any sense, so we fixed that.

MEMBER STETKAR: Yes, that's right.

MR. FRAHM: That was not intentional. It was meant to be neutral. So, really that neutral impact line on this table is really our current process, so credit would go up on this table and increased degradation would go down. And, again, this is conceptual and we wanted to make it detailed enough to give the Commission a sampling of what we were thinking.

We did run three examples through this process, this is just one of them.

MEMBER STETKAR: Those examples also remain unchanged?

MR. FRAHM: We're still going to use three

examples, and we are in the process of making changes so I believe we're still using those three.

MEMBER STETKAR: Okay.

MR. FRAHM: If anything, we might tweak -- well, we would tweak them for one thing, to line up with the new language that we added to that table, and things of that nature.

MEMBER STETKAR: Yes, I'm more interested in the --

MR. FRAHM: I think the case studies themselves are the same.

MEMBER STETKAR: Okay.

MR. FRAHM: The one that I just wanted to briefly mention is the one that involved the emergency feedwater system for the APWR where it was unavailable for three months. There was a concern with extent of condition that showed a potential to impact other qualitative elements. The quantitative evaluation yielded a delta CDF of 7.7 times 10 to the minus 6 per year, which is a White on the quantitative side. But using the qualitative measures and evaluating it through our conceptual framework it could be yellow if we did not give any qualitative credit, or white if we did give credit.

MEMBER STETKAR: Now, for the other

Members, again we've got enough time. We're doing okay. Could you -- you don't have a slide that shows that. When you say qualitative credit, again, remember that the Members have probably read through the paper but there -- in the paper there were different attributes, let me call them that, that you would evaluate qualitatively.

MR. FRAHM: Right.

MEMBER STETKAR: And one of those is called "qualitative credit," which is where you can actually go to a better color, let me call it that, if you apply that. The others primarily are used to determine whether you're neutral or worse. Is that right?

MR. FRAHM: I'd say that's a fair assessment.

MEMBER STETKAR: Okay.

MR. FRAHM: And the four that are currently in the -- in our conceptual approach are defense-in-depth, safety margins, condition time, and as you said, qualitative credit.

MEMBER STETKAR: And the definitions of those in terms of the scope remain the same.

MR. FRAHM: They do. They do, and mainly because we really want to emphasize that this is conceptual.

MEMBER STETKAR: Sure, sure.

MR. FRAHM: And that the details of the different thresholds, and even the different elements will need to be developed over time, so in the body of the paper we plan to really nail that point home.

MEMBER STETKAR: That's important.

MR. FRAHM: It is very important.

MEMBER STETKAR: Because it's --

MR. FRAHM: And the fact that it was --

MEMBER STETKAR: There's a lot of tables of those matrices.

MR. FRAHM: Right. And there was a lot of detail there, and I think it made people nervous, and understandably so, because like some have said, once you put it down, it tends to stay that way. But we're really going to temper it with, you know, noting that we needed to have enough detail to provide an illustration of how the concept would work and actually run some examples through it.

MEMBER STETKAR: Yes.

MR. FRAHM: And we'll just emphasize that in the paper.

MEMBER SKILLMAN: Ron, could I ask you please to explain Bullet 2 on that slide against the final determination table on the prior slide. How the

7.7 times 10 to the minus 6 be white, how you chose the impact notion for that event? Are you really looking at CDF?

(Simultaneous speech.)

MEMBER SKILLMAN: It says delta CDF, or --

MR. FRAHM: It doesn't appear to match.

MEMBER SKILLMAN: It doesn't appear to match, so I'm -- actually, I'm confused, not so much challenging you. I'm trying to figure out how this works.

MR. FRAHM: Is that not greater than 10 to the minus 6, which would put it in the second column quantitatively?

MEMBER SKILLMAN: Got that, so how do you get to white? So, why is it white?

MR. FRAHM: Because the neutral impact rating is the second row in that column. You see that on the figure on page -- slide 14?

CHAIR ARMIJO: The question is why is it neutral?

MR. FRAHM: Well, the impact from the qualitative aspects does not change the overall color, so we -- this was -- we were struggling with these words and we have recently come up with neutral impact to show that that's where the qualitative measures did

not change the significance.

MEMBER STETKAR: I'm going to let the staff struggle and see how well they do on this.

MR. FRAHM: And that could change five more times.

MEMBER STETKAR: It's an important concept, though, and that's why it's important that the Members understand how this is being implemented. So, you can struggle for a while, Ron, before I --

MR. FRAHM: And we are.

CHAIR ARMIJO: Ron, just explain how the qualitative measure turns a yellow into a white.

MEMBER SKILLMAN: Correct. That's my question, Ron.

CHAIR ARMIJO: Green to a white. You know, it's not immediately obvious which qualitative measure you used to do that.

MR. FRAHM: Well, you would run through the process of using qualitative measures to come up with a single qualitative rating, and that's what would feed the --

CHAIR ARMIJO: Yes. I guess it's just not visible in these charts exactly how -- what they are, and how they feed in.

MR. FRAHM: And we -- to be honest, we

intentionally left a lot of that detail out because we're trying to emphasize that that is conceptual, and we --

MEMBER STETKAR: Let me see if I can help you out here, Ron, because you're --

MR. FRAHM: That would be great.

MEMBER STETKAR: I like people sweating for a minute. You understand this so well that you're probably not backing up enough. Left to itself, given the current significance determination process numerical thresholds without any other consideration, if you look at the four columns of numbers there and just look at the delta CDF, forget the second row.

CHAIR ARMIJO: Yes.

MEMBER STETKAR: If in the current significance determination process, if the change in CDF is less than or equal to 10 to the minus 5, and greater than 10 to the minus 6, you're in the second column.

CHAIR ARMIJO: Right.

MEMBER STETKAR: Without any other considerations, things in the second column are green, without anything else.

MR. FRAHM: White.

MEMBER STETKAR: I'm sorry, white. Right.

White, white. I dropped down one. I'm sorry. White. Now, when you lay over that current process with the qualitative aspects you might be able to move up and down in that second column anywhere from green if you get qualitative credit deemed sufficient enough to overcome the quantitative aspect, or you might move down into a yellow or a red.

CHAIRMAN ARMIJO: Okay. Tell me what kind of qualitative --

MEMBER BLEY: Well, what's missing here, Sam, if I could --

CHAIRMAN ARMIJO: -- items would push it all the way to red?

MEMBER BLEY: What's missing here is in the paper there's a table, but it's an example. But if you go into that with the qualitative factors the output is either no impact, neutral, or reduced -- you get four possible outcomes, it's those four things on the left side, reduced impact, neutral impact, increased impact, really big, significant increased impact. That's an outcome of working through the qualitative factors.

CHAIRMAN ARMIJO: So, that --

MEMBER STETKAR: So, if the qualitative factors say there's --

MEMBER BLEY: You have to go into that analysis and outcome is one of those --

MEMBER STETKAR: All of those compositely are really, really bad. It could take you from a nominal white to a red, or in this particular example that Ron was showing it doesn't take you all the way to red. It might take you to yellow, or it might keep you at white depending on how you evaluate --

MEMBER BLEY: But the key is those four things on the left are the outcome of doing the qualitative analysis.

CHAIRMAN ARMIJO: Yes, I understand. I was looking for what are the -- what table says okay, these are a whole bunch of qualitative factors, and you -- these apply to t his particular incident or event. And, therefore, it's red. I just -- what bad things do you have to do to turn a white into a red?

MR. FRAHM: I don't think we have an example of how you would jump from a white quantitative lead to a red overall, but at the same time I don't think we could say that could never happen.

(Simultaneous speech.)

MEMBER STETKAR: In principle it could. I mean, that's -- but there is -- I think that's what --

the staff has been struggling with it because there is, indeed, that large table that you were asking about in one of the enclosures to the draft paper. And it does -- it shows you all of the combinations of things and how it would walk you through it. As Ron mentioned, one of the -- some of the feedback, I guess, that you've received -- you received some of it from us, but I think also from stakeholders is that they needed to develop that table so that they could show conceptually how the process would work. But, of course, as soon as you develop a big table people start looking at individual boxes, and why does this get, you know --

MR. FRAHM: Why was this threshold chosen.

MEMBER STETKAR: Yes. This nudge over this threshold and things like that, but it is developed in the paper to a sufficient level of detail if you walk through those examples to show how they got there.

MEMBER SCHULTZ: If we go back to Dick's comment, though, is what's shown on slide 15 in the last bullet does not match up with the way you described it, John. It, in fact, winds up in a different box than the second column.

MEMBER STETKAR: On slide 15?

MEMBER SCHULTZ: Yes, it's --

MEMBER STETKAR: No, it does.

MEMBER SCHULTZ: Seven times 10 to the minus 6.

MEMBER STETKAR: Right, puts you in the second column, second vertical column. And without consideration of anything else it would be a white.

MEMBER SCHULTZ: Yes, but it starts out with a --

CHAIRMAN ARMIJO: The bullet says it's yellow.

MR. FRAHM: It's missing something. I read it five times and I finally -- Jeff prepared this bullet if he's not here to talk about it, but I finally get what he was saying, is you go through the qualitative measures approach it would knock you up a level based on that qualitative evaluation. Okay? So, you could get a white if we didn't give the qualitative credit, but if we did give the qualitative credit it would stay neutral as a white. I believe --

MEMBER STETKAR: You just misspoke. Say it again. Qualitative credit, there are four attributes that they look at, three can make you worse, basically, and one can make you better. The thing that can make you better is called qualitative credit.

MEMBER SCHULTZ: Understood.

MEMBER STETKAR: That's a name for it.

MEMBER SCHULTZ: But neutral is white, and that's not what it says here. It says you get white with credit.

MEMBER STETKAR: Without credit, it would -- the qualitative analysis of the other three attributes would increase it from white, whereas quantitatively it would increase it to a yellow. So, in other words, I evaluate the three let's call them bad attributes. It would take the white and punch it up to a yellow. And if now I evaluate qualitative credit, if I determine that I can apply that goodness, it would knock it back down to a white. If I determined I couldn't apply qualitative credit, and you have to read through to determine what that means, but if I couldn't apply it, it indeed would be a yellow. It would move from its quantitative evaluation in white to a final significance determination of yellow.

MEMBER SKILLMAN: I would have thought on slide 15 you would have said or green with credit. That's what I was anticipating, going white without credit.

MR. FRAHM: Yes, it's almost missing a bullet that says -- it's running at two different

cases. Right?

MEMBER SKILLMAN: Okay.

MR. FRAHM: One where you go through the first three, as John said, and come out with yellow, and then one where you go through the first three and come out with yellow, but then the fourth one takes it back to white.

MEMBER STETKAR: This example is actually worked through in Enclosure 3, I think.

MEMBER BLEY: This slide is not a fair representation.

MEMBER STETKAR: It is not. You have to walk through the words --

MR. FRAHM: It's very brief, and a little too brief. And without the example --

MEMBER BLEY: At least one bullet too brief.

MR. FRAHM: Yes, right. I think so.

MEMBER BLEY: It looks like it's one case rather than --

MR. FRAHM: It's actually two different cases thrown together on one slide. One case where you give qualitative credit, and one where you don't.

MEMBER STETKAR: They actually ran two cases that says --

MR. FRAHM: It's probably that way for the Subcommittee.

MEMBER STETKAR: It was two cases, I'm sure.

MR. FRAHM: It was probably presented to the Subcommittee --

MEMBER BLEY: Well, we actually went through the --

MEMBER STETKAR: You actually went through the details because you would see which -- you know, we assessed that this was, I don't remember, moderately degraded, this was degraded, whatever those words were.

MR. FRAHM: I think you've got them right.

MEMBER STETKAR: The important thing for the Committee Members, though, is to understand the concept of how the qualitative measures are applied to, potentially, not always necessarily, but potentially adjust your significance determination from the purely quantitative assessment.

MEMBER SKILLMAN: Thank you. I understand.

MEMBER STETKAR: Okay, great.

MEMBER SKILLMAN: Thank you, John.

MEMBER STETKAR: Had to help you out because you said you didn't have your PRA guy;

otherwise, we would --

MR. FRAHM: And this is really the final side on this topic that, you know, as I said, this is conceptual at this point. There are a lot of future developmental considerations if the Commission directs us to go down this path that we'll need to consider.

The first one here is that we do want to avoid double counting, that if an issue is adequately covered in the quantitative aspects we don't want to double count it and, you know, essentially hit the licensee twice and count it on the qualitative side, as well. We need to develop those guidelines for how and when to apply this qualitative credit. These definitions and thresholds for all of these qualitative measures will need to be developed over the course of a few years I would think, or several months anyway to a level of detail that makes the whole process predictable, and repeatable, and understandable.

MEMBER BLEY: And that first bullet to me implies that when you do the analysis, the only things you should be looking at with the qualitative analysis are things that were not picked up in the quantitative analysis, or not picked up --

MR. FRAHM: In their entirety, perhaps.

MEMBER BLEY: -- appropriately.

MR. FRAHM: Right. I'd say that's fair.

MEMBER BLEY: And if later somebody does more quantitative analysis, they back out of the qualitative things if they do it thoroughly enough to convince you they've covered the issue.

MR. FRAHM: That could conceivably happen, sure. Yes, to the extent that the qualitative side could be as robust as possible, we would never discourage a licensee from doing that. So, that could conceivably happen.

Also, currently we had four qualitative elements. The number of these elements could change, and their impact ratings and how we define and use them. We would want to figure out how to account for scoping changes of SSCs in and out of tech specs, and we would have to develop the framework for the impact and the overall qualitative ratings. And then, of course, we need to account for uncertainty. And we actually used to have a fifth impact rating under the qualitative side called uncertainty, and we decided to try to instead cover that through the existing four, so we need to figure out how best to account for the uncertainty in the PRAs.

MS. FRANOVICH: Excuse me. This is Rani

Franovich, NRR staff. I just wanted to interject real quick on the question about whether or not we would develop more confidence if the licensee sharpened their pencils and had more precise numbers.

One of the challenges we currently have with the SDP is the level of precision that the industry and our own risk analysts are trying to achieve for making a decision between a 40-hour inspection and no additional inspection, or maybe a 200-hour inspection. So, we're currently challenged with timeliness of our regulatory decisions with significance determination process. I think that the goal of a process for new reactors and the currently operating fleet is to try to keep it as simple as possible, and not try to achieve a certain level of precision with the SDP.

MEMBER BLEY: My point had nothing to do with precision.

MS. FRANOVICH: Okay.

MEMBER BLEY: My point had to do with inclusiveness of the analysis. Did it pick up the factors perhaps that were affecting uncertainty, the things that weren't addressed in a reasonable way in the quantitative analysis.

MS. FRANOVICH: Understood.

MEMBER BLEY: But now you add those considerations in a way that's convincing.

MS. FRANOVICH: Understand.

MEMBER BLEY: It's not a precision, it's really an uncertainty statement --

MEMBER STETKAR: More of an accuracy rather than a precision --

MEMBER BLEY: Yes.

MS. FRANOVICH: Thank you.

MR. FRAHM: And they are different.

MEMBER STETKAR: They are different.

MR. FRAHM: With that, that really concludes the presentation on our conceptual integrated risk-informed approach using qualitative measures. The next portion of the paper is our analysis and evaluation of relative risk, and Eric Powell will be leading that discussion.

MR. POWELL: Thanks, Ron. Good afternoon. My name is Eric Powell. I'm a Reliability and Risk Analyst in the Office of New Reactors, and I'll be discussing the technical evaluation of the relative risk measures, as well as the reexamination of the pros and cons that was done.

So, to briefly explain and describe the relative risk approach, the relative risk approach

uses the total baseline CDF on the X axis, and the delta CDF on the Y axis for a plant to determine the significance of an inspection finding using the sloped lines for the thresholds that are shown on this slide, slide 18.

The concept behind this approach is that the lower the baseline CDF value for a plant, the lower the delta CDF value or larger fractional change necessary for increased significance of a finding. The significance of a finding would be relative to the baseline CDF value instead of the current approach which does not use -- sorry, which does not change given a particular plant's baseline CDF.

This rate is covered on the previous slide, so moving on to the technical evaluation portion of the relative risk approach that was performed. And before I describe this table, it should be noted as a disclaimer that long exposures times, as well as common cause failure of multiple trains of equipment were assumed in many of the scenarios in order to exercise the ROP.

So, for the technical evaluation --

MEMBER STETKAR: Eric, before you get into some of the details, because this is a busy table, and as soon as you get into the details you'll get

questions. You've deleted that third color column table. That is going to be gone.

MR. POWELL: We did hear the ACRS' point on the third column that was there, and that was a seismic column. And we heard your feedback and we removed that column, and we're going to use some words to describe that phenomenon that we were trying to --

MEMBER STETKAR: The concept.

MR. POWELL: Yes.

MEMBER STETKAR: Okay, thanks.

MR. POWELL: So, for the technical evaluation we took the scenarios from the 2011 tabletops and applied the relative risk approach. And the relative risk approach that we applied was a conceptual approach that the ACRS proposed in a letter on April 26th of 2012. And the result was an increase in the significance of some of the findings compared to the existing approach. And, specifically, 13 of the 19 scenarios moved up one color. And it should be noted that three of the 19 were already red based on the current SDP so they could not move up in significance.

And, also, if a finding increased in color, it would only increase in one color, it did not increase multiple colors.

This is touching on what John Stetkar was just talking about. The table did include a third column; however, we just wanted to mention that the tabletops did not include external events. They were quantified using the SPAR models. However, with external events, particularly seismic events, the -- it is likely to dominate the PRA results for plants with low CDF values for internal events. And when external events are included that this may decrease the significance of some of the findings, but the actual outcome would need to be quantified, and it's a little premature to say exactly what will happen.

MEMBER STETKAR: I think our comments during the Subcommittee meeting is it could also increase the findings if, for example, a particular deficiency was very sensitive to seismic risk. For example, if you have one turbine-driven pump in your plant and it failed, and it was your only mitigation against a seismically induced station blackout, perhaps the finding including seismic would be worse than excluding the seismic.

MR. POWELL: There are certain --

MEMBER STETKAR: It could work both ways depending on the particular deficiency that was noted. But, anyway, I'm personally, anyway, happy that you

deleted that column because it was confusing.

MR. POWELL: Okay. So, that was the main technical evaluation that was performed. The staff just wanted to compare the 2011 tabletop which was the exercising and using the existing SDP process versus using a relative risk approach for the SDP process.

So, moving on to -- sorry, this was the information that I just presented with the table. So, moving on to the reexamination of the pros and cons portion. A pro for the relative risk approach for new reactors that was discussed during the public meetings, was also the major benefit that the ACRS pointed out in both of their letters, is that a relative risk approach would be consistent with the Commission's stated expectation to maintain the enhanced safety margins for new reactors while providing greater operational flexibility than current reactors.

Continuing with the reexamination of the pros and cons, focusing on the cons portion, some of the more significant cons of a relative risk approach for new reactors that were discussed during the public meetings -- well, I guess before I get into that, I'll just inform the Members that this slide and this portion of the paper has changed significantly since

it was presented last time. We received a lot of feedback rom the ACRS Members, as well as the external stakeholders, and we've eliminated several of the cons and we've added a couple, as well. So, the major focus of the revision has been on this portion of the paper.

So with that said, the major cons that were identified and discussed were the potential to inadvertently focus licensee and staff attention on less significant safety issues. An example to demonstrate this is that a hypothetical new reactor with a baseline CDF value of 10 to the minus 6 per year would have a white finding if they had a finding with a delta CDF value greater than approximately 3E to the minus 7 per year using the relative approach. However, the existing threshold is greater than 10 to the minus 6 per year for a plant to receive a white finding.

MEMBER STETKAR: Eric, can I ask you right now, that's both of the statements that you made are numerically consistent with current process and with the curves that you've shown. What you've not said is that currently if I have a plant with a 10 to the minus 4 core damage frequency, I get a white finding. If I increase that core damage frequency by 1 percent, by 10 to the minus 6, 1 percent, a 1 percent increase

as compared to a factor of about 30 increase in your 10 to the minus 7, so that if I'm currently operating my 10 to the minus 4 plant, and I just see a little blip in my core damage frequency, I trigger white. But if I have a much lower core damage frequency, I have greater regulatory attention which doesn't mean that the plant is as safe, less safe as the 10 to the minus 4 plant, but I triggered greater regulatory attention if I get a factor of 30 increase, or a 300 times increase on a percentage basis compared to my current plant.

MR. POWELL: Mathematically yes, that is correct.

MEMBER STETKAR: On a percentage basis.

MR. POWELL: Yes.

MEMBER STETKAR: Okay. I just wanted to get that on the record because you -- the staff -- when we had this discussion during the Subcommittee meeting the staff tends to speak about things in an absolute sense. And, indeed, you're right, the comparison of a 10 to the minus whatever it was, 3 times 10 to the minus 7 or 6, I've forgotten your example, remains smaller than that other plant. But I think one of the important functions of the reactor oversight process is to draw attention to things that are on a

trajectory that might merit greater regulatory attention. Not necessarily just a comparison of absolute numbers.

MS. FRANOVICH: This is Rani Franovich with the staff. Can you help me understand the trajectory as you've explained it?

MEMBER STETKAR: Let me -- yes, I'll fall back on my automobile example now. I have somebody driving down -- the speed limit is 55 miles an hour. I'm driving down the street at 54.9 miles an hour absolutely straight. I'm obeying the law. Another car is driving down the street at 10 miles an hour weaving from side to side bouncing off the curbs. I'll probably get pulled over if I'm the second person because I'm exhibiting a behavior that may be an indication that I'm not perhaps being safe, despite the fact that under one absolute measure, the speed limit, I'm doing okay. So, that part I think of my personal view of the reactor oversight process, and the significance determination part of that is to raise flags when we feel that there are indications of a fairly -- an important enough, let's call it that, departure from our baseline notion of acceptable behavior.

MS. FRANOVICH: Okay.

MEMBER STETKAR: So, you know, just comparing that 10 miles an hour versus 54.9 miles an hour doesn't necessarily give you the only measure of perhaps getting pulled over.

MS. FRANOVICH: Thank you for that explanation. The reason I asked is, you know, a trajectory almost implies that there would be a regulatory action in response to an anticipated change in performance.

MEMBER STETKAR: No, no. This is something -- we have to have something that we can measure, either quantitatively or qualitatively. In my example, the police officer would observe qualitatively your behavior and decide that, you know, it's worth at least asking you a question.

MR. FRAHM: And if I may, I would expect that our qualitative measures would go just after that. That's exactly what they would be designed to capture, so I kind of --

MEMBER STETKAR: And, indeed, the examples sort of emphasize that.

MR. FRAHM: Right. So, I would think that that's how we would capture those types of scenarios in probably a more understandable, and reliable, and predictable manner than the relative risk approach.

MEMBER STETKAR: Might have differences over understandable, reliable, and predictable, but --

MR. FRAHM: But those are some of the conclusions and important points that we need to make in the paper.

MEMBER STETKAR: Okay. Anyway, I'm sorry, Eric, I wanted to just raise that notion of the differences.

MR. POWELL: That's a product of the ACRS graph for relative risk that was proposed had a fractional percent change, and the staff converted it to a delta CDF which is more common, what we use in regulatory space.

So, continuing on to that example to get to the point, so if you had a 10 to the minus 6 per year plant and you had a finding with a delta CDF of say 4E to the minus 7 per year, that would be a white finding and would receive more attention from the licensee, and also NRC staff members versus say a finding with a delta CDF value of 9E to the minus 7 per year at an operating reactor because that would be a green finding, and it would just go into the Corrective Action Plan, and it wouldn't receive the same amount of attention and resources.

So, another con that was raised was a concern with being inconsistent with some of the objectives of the ROP. And as Ron stated earlier, the ROP goals are objectivity, risk-informed, predictability, and understandability. And relative risk would be inconsistent with the ROP goal of understandability because it has the potential to create public perception issues if only applied to new reactors.

Using two sets of SDP thresholds, the possibility exists for findings with the same quantitative value to be different colors. This communicates to the public that the findings have a different safety significance. So, using the example that I used before, a finding of -- with a delta CDF of say 4E to the minus 7 per year, using the relative risk approach it would be a white finding. However, the existing SDP that would clearly be a green finding. And because the SDP not only communicates a performance deficiency, but also safety significance it would create public perception issues, and would be difficult to understand in that regard.

Finally, it was discussed that there was a concern with creating less incentive for licensees to enhance safety margin. Under the current SDP

approach, if a licensee made an improvement that decreased their baseline CDF value, then that would increase the delta CDF value that would be necessary to receive a greater than green finding. However, under a relative risk approach, if a licensee made an improvement that decreases their baseline CDF value, then that would actually subsequently decrease their CDF -- their delta CDF value that would be necessary to receive a greater than green finding. Thus, the enhancement in safety margin would effectively result in a stricter SDP threshold when applying the relative risk approach.

MEMBER BLEY: Eric, do you think these ideas had been worked through when 1.174 was put together?

MR. POWELL: Do I think that these specific cons were --

MEMBER BLEY: Yes.

MR. POWELL: I can't answer that question.

MEMBER BLEY: I think they considered all of these things, and that's what eventually led them to what's in 1.174.

MR. POWELL: I cannot speak to the development of 1.174. I did not work on that. I mean --

MEMBER BLEY: If you read 1.174, you see that these ideas are there.

MR. POWELL: I would ask Donnie Harrison from -- he's the SL in NRO, if he has some comments to help.

MR. HARRISON: Yes, this is Donnie Harrison from the staff. If you go back into the late 1990s, yes, there were discussions about should this be in Reg Guide 1.174, should you have a slope line. And what the staff ended up with was a stair step for like CDF where you had a delta CDF in a stair step at 10 to the minus 4 and 10 to the minus 5 for the total base. But they were tying that to the safety goal policy as the, if you will, ultimate starting point for that development. So, those discussions at least theoretically were held about how to draw the Reg Guide 1.174 charts. I don't know if they actually walked into the issue of public perception and that type of thing, but they did think about the relative risk perspective in doing that.

MEMBER STETKAR: I'm a little bit curious about the third bullet and the way you've presented that because I'm not sure that your conclusion follows from the way you presented it. As I -- it sounded like the kind of notion that people use in terms of income

taxes saying that I should not work another hour because the government is going to take instead of 30 percent, 31 percent of that extra dollar that I have. I still have that extra -- I still have 69 cents instead of 70 cents of that dollar, so in terms of money in my pocket, I still have an incentive to work that extra hour. As long as the government tax rate doesn't become 100 percent of that extra dollar, there's always an incentive to work that extra hour. So, in terms of --

CHAIRMAN ARMIJO: Diminishing.

MEMBER STETKAR: But in terms of enhancing my safety, if I'm interested in enhancing my safety -- if I'm not interested in enhancing my safety, I probably shouldn't be operating a nuclear power plant. But if I'm interested in enhancing my safety, provided that the margin that I'm allowed doesn't overwhelm my increase in safety, I don't see why that's a disincentive to increase my safety to do something that would increase absolute safety because I'm still -- I'm not being taxed 100 percent of that increase for that reduction in core damage frequency.

MR. POWELL: I understand the point that you're making; however, I would still say that the fact remains that using a relative risk approach

you're creating less incentive for a licensee to enhance a safety margin because as they lower their baseline CDF value, you're also lowering the delta CDF value along with it that would be necessary to achieve a higher than -- or greater than green finding.

MEMBER STETKAR: Because you keep thinking in terms of absolute values. If you think of tax rates, fractional values.

MR. POWELL: I hear and understand what you're saying --

MEMBER STETKAR: The fractional value does, indeed, increase.

MR. POWELL: That is true.

MEMBER STETKAR: But it increases at a slower rate than the absolute value. That's the whole nature of the way that those curves work.

MR. POWELL: Yes, that is a fact.

MR. FRAHM: And what we're really saying here is that --

MEMBER STETKAR: You still make money by working the extra hour.

MR. FRAHM: Right. Not that there's no incentive, or even a disincentive, as you mentioned, but there is less incentive.

MEMBER STETKAR: Yes.

MR. FRAHM: It's relative, there is less incentive, so that's not overstating that point.

MS. FRANOVICH: Rani Franovich, NRC staff. This is a bullet that perhaps the industry can also address when they come and address the ACRS.

MEMBER STETKAR: Okay.

MR. POWELL: That was all I had for my potion of the presentation. Were there any other questions? Okay, hearing none, I will turn the presentation over to Mike.

MEMBER STETKAR: Now we get to the really controversial stuff.

MR. BALAZIK: Good afternoon. My name is Mike Balazik. I'm the Performance Indicator lead in the Office of Nuclear Reactor Regulation.

I was tasked with reviewing the current set of performance indicators to determine if they could be applied to new reactor designs to inform a regulatory response, and this was Item 3 of the SRM.

In reviewing the performance indicator basis documents along with several reactor oversight process policy documents, it was determined that many of the PIs are based on regulations and standards that could apply to new reactor designs. Six of the current 17 Pis are directly related to risk. These six PIs are

contained in initiating events in the mitigating systems cornerstones.

Mitigating systems performance index which incorporates five PIs because it monitors five different systems, and unplanned scrams per 7,000 critical hours are directly related to risk. So, you can also see the systems that are monitored by MSPI in this slide. The remaining 11 PIs and thresholds were more deterministic and could apply to new reactor designs to determine a regulatory response. These thresholds were mainly based on historical performance in both industry and NRC experts. Next slide, please.

In a nutshell, MSPI is basically a sum of changes in a simplified core damage frequency evaluation for the monitored systems on the last slide resulting from differences in unavailability and unreliability compared to an industry baseline value. I'd like to add, MSPI was evaluated in the previous SECY-12-0081 and did various tabletop exercises, and it was pretty much determined that MSPI was not adequate and would be largely ineffective in determining an appropriate agency response for active new reactor designs. Furthermore, MSPI might not even be possible to -- for passive systems that are in these new designs.

MEMBER CORRADINI: So, can you stop here for a minute?

MR. BALAZIK: Yes, sir.

MEMBER CORRADINI: Can you repeat that, please?

MR. BALAZIK: For passive systems, MSPI would have a hard time as the indicators are formulated now even determining a reg response for passive systems in reactors.

MEMBER CORRADINI: So that means you'd ignore them, or you'd have to use a deterministic approach? How would you --

MR. BALAZIK: We'd have to develop another process, either inspection or come up with a new different formulation to MSPI for new reactors.

MEMBER CORRADINI: So, is that like a user need that research might help you with?

MR. BALAZIK: Yes, sir.

MR. FRAHM: That could very well be.

MS. FRANOVICH: It could be.

MEMBER CORRADINI: Because there used to be somebody that sat in this chair many years ago that asked about passive safety features and the reliability of them, and how you know when they're failed. And it still seems to be out there as a need.

MR. BALAZIK: Yes, sir. We'll have to develop something to be able to capture the passive systems for new reactors.

MS. FRANOVICH: NRR staff, Rani Franovich, or inspection. Inspection could also compensate for that lack of information that we miss from MSPIs for new reactors.

MEMBER CORRADINI: Is that something -- I was in and out so I'm kind of guilty, so I don't dare say -- do you have qualitative measure approaches for these fuzzier ones yet?

MEMBER BLEY: They don't have qualitative measures for real for anything yet.

MEMBER CORRADINI: Okay.

MEMBER BLEY: They have an example.

MEMBER CORRADINI: Okay.

MR. FRAHM: But that would be something we would consider going forward certainly.

MEMBER STETKAR: Okay. There's a separate recommendation in their paper specifically for MSPI and its treatment.

MEMBER CORRADINI: Okay. Excuse me. Go ahead.

MR. BALAZIK: The other risk-informed performance indicator in plant scrams, simply a

measure of the rate of scrams over a year time frame. This indicator provides an indication of initiating events frequency. The unplanned scrams thresholds, they're based on a combination of performance and CDF sensitivity studies. The green/white threshold which is greater than 3.0 is based on an achievable level of performance to identify outliers. The threshold was set based on industry average of 2.1 reactor scrams per year, and that was I believe back in the late `90s.

The white/yellow and yellow/red thresholds which is 6.0 --

MEMBER POWERS: Is it that high now?

MR. BALAZIK: Yes, sir.

MEMBER POWERS: 2.1 on average per year --

MR. BALAZIK: Per reactor -- I'm sorry. Go ahead, sir. I'm sorry.

MEMBER POWERS: It sounds very high.

MR. BALAZIK: For today's standard yes, it is high.

MEMBER POWERS: Do you know what the rate runs typically now?

MR. BALAZIK: I would say it's around .7 or .6.

MEMBER POWERS: I would have guessed .5.

MR. BALAZIK: Okay.

MEMBER POWERS: I mean, every couple of years you have one.

MR. BALAZIK: But then I think if you look back to the early `90s --

MEMBER POWERS: It used to happen all the time.

MR. BALAZIK: Exactly.

MEMBER POWERS: When I first got involved they were a regular occurrence. Now I think it shocks the hell out of everybody when it occurs. I mean, it has to be one of the great accomplishments of the nuclear industry that accompanied the ATWS rule, was reducing in plant scrams, which raises the question, is it a good metric now? I mean, it's so uncommon, why is it a good metric?

MR. BALAZIK: Well, I still think that even the green/white threshold that captures the outliers from the average that we need to go in potentially inspect. And, also, we have seen the yellow crossed which, you know, that's 6.0, which is a pretty high number. We've had that crossed. And I think it was also concluded in the 99-007 SECY that 25 is kind of a crazy number, that we never exceed that.

MEMBER POWERS: Yes, of course. It may be

essential to have it as a metric just because of the ATWS rule.

MR. BALAZIK: Yes, sir.

MEMBER POWERS: That, I mean, the key to success there is don't have a lot of challenges. You make your reactor protection system as good as you can and then don't have any challenges to it.

MR. BALAZIK: Just to go through the settings of the white/yellow and yellow/red thresholds, the data -- I'm sorry, they're based on sensitivity studies to determine how core damage frequency changes as the PI value changes, data indicate a change of CDF of 1 time to the minus 5 th, would be in the range of 6 to greater than 10 scrams on a year time frame, and a CDF of 1 times to the minus 4 to be equivalent to about 35 to even some models indicated would be over 100 scrams per year.

The current thresholds were set conservatively to capture the low number of initiating events. Since new reactor designs are estimated one or two magnitudes lower in risk, the current thresholds would sufficiently identify declining performance to initiate a regulatory response. Next slide, please.

In conclusion, it was determined that MSPI would be largely ineffective in determining regulatory

response. Alternate PIs could be developed or additional inspection could be used for the new reactor designs. As I just stated, unplanned scrams indicator can apply to the new design since the thresholds were set conservatively and would sufficiently capture declining performance.

One thing I'd like to note is that scrams with complication basically informs the NRC that a scram is more risk-significant than a normal scram, but the PI threshold is based on industry performance. And what you do to determine if a scram is complicated is you go through a series of questions, of qualitative questions and answer the questions. These questions would need to be developed for the new design technology, so that is one thing that we would have to develop, even though the PI itself and the threshold could apply to the new designs. And the remaining performance indicators, as I said earlier, can apply to the new designs to determine an appropriate response.

That concludes the presentation regarding performance indicators. I will add that I've made no changes to the enclosure since the Subcommittee meeting. And if there are no questions, I'll turn it back over to Ron.

MEMBER SCHULTZ: I have one question or comment, I guess.

MR. BALAZIK: Yes, sir.

MEMBER SCHULTZ: Since the overall approach here is to risk-inform the process for new reactors, I'm somewhat surprised that this is -- that the conclusion isn't more forceful to determine what we not could do, but what we should do for new reactors in --

MR. BALAZIK: Yes, sir.

MEMBER SCHULTZ: -- terms of mitigating system performance index. From what you've said with the investigation that you have done over what currently exists, one would conclude that for MSPI one ought to have new or additional approaches associated with MSPI, and the conclusions associated with scrams also.

I mean, you can get into the numbers game and say well, you know, some of these scrams, what does it matter? But yes, it does matter in terms of an indicator of an issue or problem at a unit. So, I would think that these would be -- and you've identified them appropriate things to do for new reactors, and to develop an appropriate framework in which we would move forward. So, I think you've got

it. I just thought it would be presented more forcefully as what ought to --

MR. FRAHM: I believe it is in the paper, in the conclusions and our recommendation we do present it the way you just described.

MEMBER SCHULTZ: Rani.

MS. FRANOVICH: Yes, I just wanted to add that the Commission asked us to really discuss the appropriateness of the existing performance indicators and the related thresholds for new reactors, so we've just tried to answer that, and understand your point that there is a lot of work yet to be done in developing what would make sense for new reactors.

MR. FRAHM: And that is one of our recommendations. Okay. Any other questions at the moment on performance indicators? Okay, moving on to our conclusions, which is really a wrap-up of the technical evaluations and the discussions we've had so far.

We feel that the integrated risk-informed approach, or an integrated risk-informed approach using qualitative measures is an appropriate means to identify the potentially significance performance issues, and we're really talking about inspection findings here that would not otherwise be revealed

solely by the risk calculations to insure an appropriate response by the NRC and licensees.

And this ties back to the principles of good regulation and the goals of the ROP. We believe that the integrated risk-informed approach would provide a clear and efficient way of insuring reliable and predictable responses, and doing so in a timely manner prior to an unacceptable erosion in safety margins, which is what I believe the relative risk approach is intended to get at. So, we feel we're getting at that, we're scratching that itch with our proposed integrated risk-informed approach.

Moving on in the area of relative risk, we do believe that the relative risk approach may potentially have merit, but the cons of such an approach do outweigh the benefits, and that's how we plan on capturing that in the paper. As far as the performance indicators go, as Mike just said, many of the PIs are based on regulations and standards that also apply to new reactors, but the MSPI in particular would need to be developed over the next few years, or some other replacement that would be applicable for new reactors, as well as defining the complicated scrams, and revising that guidance accordingly.

So, based on our conclusions, we came up

with two recommendations, and these are consistent with -- maybe worded slightly differently but consistent with what was in the draft. We recommend that the Commission approve our plan to develop qualitative measures in an integrated risk-informed approach to insure an appropriate regulatory response. We will emphasize in the paper that Enclosure 2 is an example of what an approach could look like, but not necessarily -- we're not recommending that they bless off that approach, in particular.

In addition, we recommend that the Commission approve our plans to develop the appropriate PIs that are needed to address the shortfalls that the MSPI demonstrated as far as making sure that all cornerstone objectives are met.

And then the last two bullets we're really missing from the draft paper, and I think they're very important, that the details of both of these recommendations could be developed and evaluated over time with stakeholder involvement, and then adjusted based on experience, and that we would go back to the Commission prior to implementation with an Information Paper, or whatever is necessary to let them know what our plans are, and make sure we're in line with their expectations.

Now, the next several slides are really a summary of the changes that we've made to the draft, and are really in the process of making based on feedback during the ACRS Subcommittee meeting, and the public meeting on August 5th, and other feedback. I did want to point out that the format of the paper and our conclusions and recommendations did not change substantially, wording changes here and there, but the supporting facts and the arguments will be strengthened throughout the paper and clarified. We will update the paper to reflect the interactions with industry and ACRS and the feedback over the past several weeks since the draft was created.

We do want to provide a clear tie of our conclusions to the ROP goals and principles of good regulation, as we've discussed throughout this presentation. We do want to address any potential inconsistencies between the main body of the paper and the details that are in the enclosures. It was noted that there might be some inconsistencies. We're still trying to identify those and make sure that those are fixed and the messages are consistent. We also want to provide a better balance of the pros and cons to each approach which I believe we're accomplishing.

Moving on, we do want to emphasize that

the qualitative measures will be designed to capture performance degradation prior to an unacceptable erosion of safety margin. I believe that was in the paper, but it wasn't really emphasized, and I think that can be improved.

And, again, we did want to emphasize that Enclosure 2 is conceptual. This might be the fattest bullet on the slide to demonstrate it's a potential approach to integrated qualitative measures vice the definitive approach. We will add additional clarifications and explanations throughout the paper to avoid the perception that that approach has been fully developed and vetted, and that that is the exact approach that we're recommending. And we also want to add to the technical basis for using such an approach, as well as a conclusions paragraph to Enclosure 2.

In addition, we did want to clarify that the relative risk approach may have merit, but that the cons to such an approach outweigh the potential benefits. The draft actually said that we concluded that that was not viable, and we realized that that was probably a little strong, so we want to clarify in the way I just said. And we do want to streamline and focus on the most significant cons and the supporting explanation associated with the relative risk

approach.

And then we'll consider making minor improvements to the PI appropriateness discussions in Enclosure 4, although Mike just said that we might not be, so we have the potential to make some minor adjustments there, but they would not be significant in any way.

Moving on, we do want to add some discussion in the main body of the paper that there are other existing ROP processes that could be leveraged. And, in fact, this was in an earlier version of the draft, such as we have an ongoing self-assessment process, and we're always looking to make improvements based on feedback and lessons learned.

We do have an action matrix deviation process for our prescriptive process that we described earlier of coming inspection findings and PIs into the action matrix. If that doesn't give us the response we're expecting based on other potentially subjective measures or any other considerations, we always do have the option to deviate from the action matrix. And any and all findings are entered into a licensee's Corrective Action Program, and the NRC does evaluate them for potential crosscutting aspects. And all of these processes would continue regardless of what

approach we take going forward.

We do want to address the industry's proposal that they had at the August 5th meeting as well as in their submitted comments that we might want to consider postponing making any changes at this time and just use the existing ROP until operating experience is available. I assume in the closing minutes industry will bring that up in their discussions, but we do want to address that and recognize it in the paper. And we do want to note that the proposed integrated approach is consistent with the current processes used to evaluate findings and determine event response. And that we already do use deterministic factors in subjective -- qualitative measures but this would be in a more structured manner, but it is consistent with what we already do.

MEMBER REMPKE: Could you elaborate on how you plan to address the industry's proposal? Do you have thoughts on it at this time?

MR. FRAHM: Well, what we plan on doing is referencing the fact that we had this public meeting, that it was brought up as a potential option to continue with basically the status quo approach. But we plan on bouncing that off of the principles of good regulation and the ROP goals, and that we are looking

to be as risk-informed as we can be. We want to be understandable, predictable, and we just feel that that approach really doesn't answer the mail and get us to where we need to go.

We do believe that there's room for improvement, and we do have existing resources to use over the next several years. As part of our ongoing improvement process we could develop these qualitative measures, and have them in place. And then refine them over time based on lessons learned.

MS. FRANOVICH: This is Rani Franovich, if I could just add. One of the troubling aspects with the status quo is that if we don't achieve the regulatory response that we think is appropriate for a particular performance issue we have to invoke the action matrix deviation which invites a little less reliability into the process. So, it's not a preferred option but we will acknowledge that it has been proposed by the industry.

MR. FRAHM: It would actually rely on processes that are in the current reactor oversight process that are intended to be infrequent like the action matrix deviation process, as well as the use of the Appendix M that we talked about for the significance determination process which relies more

on deterministic measures but in a unstructured manner; whereas, our approach provides a lot more structure to that process.

Our final slide here that has the last few bullets on the summary of changes, we do want to emphasize that the details of the integrated risk-informed approach will need to be developed over time with stakeholder involvement, and then adjusted as necessary based on experience. We want to note that the approach once developed could be tested and evaluated potentially via tabletop exercises or pilot exercises similar to what we did two summers ago, and back in the day when we implemented the ROP in 2000. And we do want to mention, as I stated earlier, that we want to add the discussion in the paper and in our conclusions that we would plan to go back to the Commission with the details of our evaluations and the proposed guidance and approach prior to implementation. So, with that, that's our prepared presentation.

MEMBER STETKAR: Thank you very much. Any Members have any more questions for the staff? Just to alert you, we -- the current state of knowledge is that we're planning to write a letter on this. And just for your information, because the only written

material that we have is that June, July, whatever the date of it is report, we're going to write -- we would write the letter against that. So, we hear what you said on the last few slides here and try to note contradict anything there, but still in terms of reference anything that we'd refer to in the letter would be for that document. Any other questions for the staff?

MEMBER SKILLMAN: Yes, I have two comments. To the top bullet on page 34, a verb that has been used in the last number of months here at the Agency is harmonization, a verb that kind of communicates getting all the pieces lined up. And my comment is, is it part of this process to make sure that changes to the ROP are consistent with other changes to other similar policies in the Agency?

MR. FRAHM: I'd say that's something that we always take into account. We did bring up that this is consistent with the ongoing efforts of the Near-Term Task Force Recommendations 1 and 12, I believe it is, so we do always take that into consideration, and we do coordinate with other areas. That's part of the process.

MEMBER SKILLMAN: It seems to be a very important part of the process to those who look out on

the fleet and watch the transition from south to ROP, and will now witness the transition from the present ROP to a different ROP, there is the fear and trepidation when the words "significance determination" is going to be conducted, because many times the licensees don't really know what's going to come out at the other end of that pipeline. So, there is a need for, as you have repeated several times, for a consistent, well understood, actually endorsed product from that process. So, when this is completed there needs to be some real buy-in so that when you say this is how bad this violation is, the licensees say we get it, and we understand. We know how you got there.

MR. FRAHM: That would be the goal.

MS. FRANOVICH: If I could just add one thing. It's a point that resonates with the staff. When I think of the harmonization, what I envision is a harmonization where the current fleet and the new reactors are really subject to the same decision making process which I think makes a lot of sense, not just for the industry, but other external stakeholders who try to understand why we make the decisions we make, and get confused if we use different rules for different vintages. So, good comment. Thank you.

MEMBER SKILLMAN: Thank you, Rani. I agree, thank you.

MEMBER SCHULTZ: Just to follow-on there then, Rani. That is -- I'm reading the recommendations and the presentation to say this is for new reactor designs. This is the process we're discussing for new reactor designs. We're not harmonizing a process that's going to be applicable across the fleet.

MR. POWELL: That is true based on the way the Commission worded the SRM.

MEMBER SCHULTZ: Right.

MR. POWELL: They focused on the new reactors and evaluating another SDP process for new reactors.

MEMBER CORRADINI: So, not to delay the Chairman's work, so Watts Bar is not new?

MR. FRAHM: That is true.

MS. FRANOVICH: That is true.

MEMBER CORRADINI: We're harmonizing here on the fly, Watts Bar is not new, but Vogtle and Summer are?

MEMBER STETKAR: Hold on a second. In the draft paper there's some discussion about this, and I thought the staff concluded that there's -- you didn't want two different processes, one for whatever is new,

and one for whatever is not new, and that you've basically developed a process that applies across the board to every plant operating in the United States.

MR. FRAHM: We actually have that mentioned in the body in discussion of the paper --

MEMBER STETKAR: And that's still --

MR. FRAHM: -- but not necessarily in the conclusion and the recommendation --

MEMBER STETKAR: But, I mean, that's still in the body of the paper.

MR. FRAHM: Absolutely.

MEMBER STETKAR: Okay.

MR. FRAHM: Yes.

MR. POWELL: We mention it, but the evaluation is focused on there being a different SDP for new reactors.

MEMBER SCHULTZ: That's what I'm trying to rise up to --

MR. POWELL: We mentioned the staff would like them to be consistent --

MEMBER SCHULTZ: What is the conclusion here?

MR. POWELL: -- but the evaluation was for new reactors and only considering it for new reactors because that's what the Commission asked us to do.

MS. FRANOVICH: If I could just interject to try to clarify, I may have created some confusion with my comment. A relative risk approach would be a departure from the current ROP. What we tried to highlight in the paper is that using something similar to what we've already used in the ROP with deterministic considerations, qualitative considerations is more elegant for several reasons. One is, we don't have to explain that delta from what we're already doing. So, it could be a very elegant outcome that what we apply to new reactors, we would also apply to the current fleet, but in concept we're already applying qualitative considerations to the current fleet. We're not applying a relative risk approach to the current fleet. That would be a totally new thing for new reactors.

MEMBER SCHULTZ: Understood. Thank you.

MS. FRANOVICH: I hope that helps.

MEMBER SCHULTZ: It does.

MS. FRANOVICH: Sorry for the confusion.

MEMBER STETKAR: Anything else from the Members for the staff? If not, I know that we have at least one member of the public industry that would like to make some comments, so I'll open up the floor to public comments. Yes, just come up, Biff, to this.

Just identify yourself.

MR. BRADLEY: Biff Bradley, NEI. First of all, let me thank the staff for the discussion today. I did learn a few things. We have had a great dialogue with the staff on this. It has been very open, and I think we've had a good constructive interaction. I did hear the staff say today that they want to take some time to develop this, and that they want to go back to the Commission. I think those are good observations.

I do -- you know, I think most of the things that are pertinent have been discussed at some length today, but let me just reiterate a few things that I think are of real importance to the industry. One, the ROP and the SDP is a very significant process for the operating plants. I has large outcomes with regard to public relations, financial, community, and many other aspects that may not always be obvious when you're talking about a green versus white finding. But the significance of this is not small.

I'd like to come back to the point of it seems like we're trying to solve a problem that hasn't been evidenced. And looking at the SDF trends for operating reactors, many of which have fairly low CDFs compared to others, there's no evidence that I can see that we're degrading our CDFs over time through either

performance deficiencies or license applications, so it appears we're trying to address a hypothetical problem which leads to the discussion we just had about maybe we should stay with the status quo until there's some evidence that there's some real issue.

New plants are required by regulation to have PRAs meeting all endorsed consensus standards. That means right now internal, external, fire and power, they're required to report those results on a periodic basis so if there's a CDF degradation going on at these plants, it's going to be very obvious. And at that point, maybe it would be appropriate to consider some of these things.

One of the real successes of the ROP and one of the fundamental tenets of it is objectivity. I think it's been a success, it's been a successful application of risk, and I do get worried when we start introducing large numbers of subjective considerations explicitly into the process as is suggested by Enclosure 2 that the staff has provided.

There's a difference between a deterministic backstop and a qualitative consideration. The Commission asked to justify deterministic backstops. That's a much narrower term. Deterministic backstop is an MSPI, if I hit so many

scrams I'm going to get the hit regardless of what the risk value is. We talked about that.

Qualitative considerations encompass a much larger open field of things that can be brought to bear, and could start slipping us back toward more of a SALP-type process versus the semi objective current ROP.

There's been quite a bit of discussion about applicability to all plants, and I think the staff is wise to point out that this is likely to ultimately fall back on all plants. I think it's a little bit optimistic to assume NRC is going to be able to maintain double standards for significance of inspection findings on new plants versus operating plants, and that ultimately this would turn into one system.

I think the staff has also said that the qualitative considerations they're proposing are intended to capture some of the subjectivity that's in the current system just to make those considerations more explicit. That's probably a good idea, and that's probably consistent with the principles of good regulation.

On the other hand, what I'm hearing is that these considerations actually elevate the colors.

They don't have a neutral impact on the way the system is done today to the way it's being proposed. We saw the results and we're having higher colors and more findings with elevated color through the qualitative or the relative risk approach.

I guess my fundamental question is why is it determined that we need to have more higher colored findings at this point in the ROP absent any overall degradation?

Relative to Enclosure 2, anything we do in the industry the details are important. You know, we can have concepts but it's the details that really drive the implementation of anything. Enclosure 2 is a very detailed process. I remain concerned that it's premature to be putting that in front of the Commission. I understand the staff saying we're going to come back. It would be interesting to see if we come back with a blank sheet of paper, or if we come back with trying -- you know, Enclosure 2. Sort of hearing we're going to come back with a blank sheet of paper, and this is a demonstration, so that remains to be seen, I think. We will continue to believe it's premature to provide that to the Commission either as an example or as a whatever else it may be perceived as.

There's quite a bit -- a little discussion of harmonization here in the meeting. And I also have Reg Guide 1.174, I was around. One of the benefits of being old, I was around when 1.174 got debated, and there was a lot of discussion of relative versus absolute risk.

(Off the record comment.)

MR. BRADLEY: And there were -- things were done the way they were for a specific reason, and 1.174 does not use a relative risk approach. There's also harmonization of all the risk applications, whether it's licensing changes, ROP. Everything is supposed to be derived and consistent with the subsidiary objectives of the safety goal, and this is where you're making -- if you go to relative risk, you're making a step change here for a set of plants relative to the others that appears to depart from the consideration of the impact on the subsidiary objective or the degree of that impact.

Finally, I'd like to mention on defense-in-depth, Recommendation 1, which I'm also responsible for at NEI, and we had a meeting here on that yesterday, defense-in-depth is central to that discussion. Staff is saying we need to look at it and develop a policy, or at least propose to the

Commission that we develop a policy. It seems like we're getting well ahead of the discussion here by proposing an explicit set, a very lengthy and explicit set of "DID" or qualitative considerations for this specific application in advance of whatever that policy, or whatever that structure may ultimately be. The staff is defining their solution to Recommendation 1 in advance of the Commission, or NRC management approving the path forward.

I do appreciate the staff's intent to tabletop. We had very successful and very detailed tabletops when we first started into this process. That is missing right now. That kind of thing would have been very important before something like Enclosure 2 came popping out. And right now, that came out ahead, we still need to do those tabletops and really understand the results of these qualitative considerations.

Final point I want to make, a lot of analogies with cars and taxes, so I started thinking about my own here, and here's mine. You have a 1962 Chevy with lap belts and a metal dash, and you have a 2013 Mercedes with dual airbags and everything else. And both get caught doing 70 miles an hour in a 55, so the `62 Chevy gets a warning and the 2013 car gets a

ticket or a trip to the jail house. So, that's my analogy. It doesn't seem entirely logical that -- maybe it's not a good analogy.

MEMBER POWERS: But the Mercedes guy can afford the tickets.

(Laughter.)

MR. BRADLEY: Again, we've had a great dialogue with the staff. I do appreciate the openness. It's been very good in that regard, but we do remain quite concerned with this concept of evolving the ROP into either through qualitative or relative risk into a system that's going to generate more findings of elevated color, and have significant impacts on the plants.

We had one of our executives in here at the last meeting that I wanted to try to give you a perception of what those impacts are. And, believe me, they're not insignificant. There are very, very large investments being put into these new safer plant designs. There's a punitive aspect to this, I think, or at least a perception of a punitive aspect to trying to make the plant safer, so thank you. If you have any questions I'll be happy to --

MEMBER BROWN: Yes, how about a 1951 Ford with no seat belts --

(Off the record comments.)

MEMBER STETKAR: Anything else for --

MEMBER POWERS: There is a consequence to having findings, and if you're going to build a safer plant we should not be looking for -- constancy of finding rates would be surprising. What I worry about is this interface with defense-in-depth. You brought up 1.174. The motivation of 1.174 was that we realized defense-in-depth would trump risk analyses always unless there was some constraint on defense-in-depth which is otherwise an unconstrained safety philosophy.

It looks to me like we're slipping on -- and back into the old practice of it didn't matter what the risk said, we'll put this into defense-in-depth. I mean, is that what you're worried about here?

MR. BRADLEY: Yes. I think it's -- yes.

MEMBER POWERS: I think -- I mean, that's what 1.174 was intended to do, was to find that interface. And we left it somewhat nebulous because we realized there were two schools of thought on this, and we didn't have any mechanism to bridge it. But that there is an interface that has to be respected I think is still the reason we have 1.174.

MR. BRADLEY: I agree with that.

MEMBER STETKAR: Any other questions? If

not, thanks, Biff.

MR. BRADLEY: Thank you for the opportunity.

MEMBER STETKAR: Appreciate the comments. Any other comments from anyone in the room? If not, I think the phone bridge line is open. If there's anyone out there, if you could just indulge us and at least say something that -- so know that the bridge line is open. Is there anyone out there? If not, I guess we've received all the comments we can receive from that venue. Again, thanks very much to the staff, thanks to industry for their comments. And, Mr. Chairman, 10 m minutes late. It's back to you.

CHAIRMAN ARMIJO: Okay, thank you, John. We're going to take a break. Let's try and be back here at 5 of 3.

(Whereupon, the proceedings went off the record at 2:38:46 p.m., and went back on the record at 2:56:47 p.m.)

CHAIRMAN ARMIJO: We'll reconvene. Now we lost two members, do we have a --

MEMBER STETKAR: Yes, we're seven.

CHAIRMAN ARMIJO: We've got seven?

MEMBER STETKAR: We're only seven, 15 members.

PARTICIPANT: Seven, that's it.

CHAIRMAN ARMIJO: We've got 14.

PARTICIPANT: 14 members.

MEMBER STETKAR: 14 members. Oh.

CHAIRMAN ARMIJO: We're okay.

PARTICIPANT: Here comes Charlie.

CHAIRMAN ARMIJO: All right.

MEMBER STETKAR: You've got a quorum.

CHAIRMAN ARMIJO: Okay, Dick, it's all your's, and it's the Regulatory Guides 1.79 and 1.79.1.

MEMBER SKILLMAN: Good afternoon. I'm Gordon Skillman. I'm the Subcommittee Chairman for the Review of Reg Guides 1.79, pre-operational testing of emergency core cooling systems for pressurized water reactors, and Reg Guide 1.79.1, initial test program of emergency core cooling systems for new boiling water reactors.

On December 3rd, 2012, ACRS Regulatory Policies and Practices Subcommittee held a meeting with the staff on this matter, Reg Guide 1.79 and 1.79.1 related to the pre-operational and startup testing of the emergency core cooling systems.

As background, Revision 2 of Reg Guide 1.79 updates the 1975 guidelines for pressurized water

reactors. The revised 1.79 has pre-operational testing guidelines for new PWR designs licensed under 10 CFR Part 52, such as the APWR, the AP1000, the EPR, and new PWR designs licensed under 10 CFR 50. Reg Guide 1.79.1 provides guidance for new boiling water reactors licensed under 10 CFR Part 52, such as the ABWR and the ESBWR, and new BWR designs licensed under Part 50.

These two regulatory guides incorporate lessons learned from operating experience at the current fleet and from ongoing Part 52 licensing efforts that will improve the effectiveness of the initial pre-operational, startup and power ascension testing programs in addressing potential ECCS vulnerabilities in these new plant designs.

Among the lessons learned, our issues addressing in 1.79 and 1.79.1 are the effects if debris, strainer sump blockage, and gas accumulation in the ECCS.

Now, during the Subcommittee during -- on December 3rd of 2012, ACRS members had comments that clarified the language of the draft Reg Guides and proposed some content changes. The staff reviewed the ACRS feedback and incorporated the changes appropriately. And the package you have in front of

you is NRO's response to the ACRS comments on 1.79 and 1.79.1.

I understand that the Staff has made additional changes that are mostly editorial to the Regulatory Guide versions that you have received electronically. I request the staff to discuss the specific changes during this presentation. I invite the staff to include in their discussion the proposed text changes regarding the emergency letdown system that has been discussed previously. And hard copies of the latest versions of the Reg Guides are in your packages.

This meeting is open to the public. We will now proceed with the meeting, and I call up Kerri Kavanaugh, Branch Chief at NRO Construction Quality Assurance Branch to take over. Kerri.

MS. KAVANAUGH: Thank you. Thank you for providing us this opportunity to discuss our Reg Guides with you. It's been a lot of effort, and as you will see the staff has considered all of your comments and we believe we've appropriately incorporated those comments into the revised Reg Guides.

With that, Frank, would you like to start your presentation?

MR. TALBOT: Sure. Again, my name is Frank

Talbot. I'm a Reactor Operations Engineer in the Quality Assurance and Vendor Branch, and I have been the Lead Technical Reviewer responsible for updating Reg Guide 1.79 and creating Reg Guide 1.79.1.

As part of this presentation I will discuss background information and objectives for updating Reg Guide 1.79 and creating Reg Guide 1.79.1. I will summarize the revisions made to Reg Guide 1.79 and 1.79.1 from public comments. I will also summarize resolution of ACRS comments in both Reg Guides. And then the ACRS can then provide any comments or questions they have for the NRC staff based on the current guidance that we have today.

In 2011, the staff identified a need to update Reg Guide 1.79, Revision 1 due to NRC review of PWR design certification applications. The staff identified five new ECCS pre-op tests for PWRs licensed under Part 52, and this involved the US APWR, the US EPR, and the AP1000.

The staff also identified a need for a new Reg Guide, Reg Guide 1.79.1 for testing new ECCS in the ABWR and the ESBWR. All the information was obtained from NRC review of the design certification documents for those applications, and the staff identified three motivating factors for updating Reg

Guide 1.79 and Reg Guide 1.79.1, and that is Reg Guide 1.79 was issued in 1975 and is quite old. Since 2008, the NRC reviewed, of course, the new LWR DC and COL applications for new testing information on ECCS, and there's lots of lessons learned from over 37 years of ITPs.

The regulations for Reg Guide 1.79 and Reg Guide 1.79 guidance should be the regulations that are listed on this slide. They should also meet NUREG-0800, SRP Section 14.2, and Reg Guide 168.

Again, Reg Guide 1.79 included five new ECCS pre-op tests and new PWRs, and Reg Guide 1.79 was revised to add lessons learned information from ECCS testing.

Here are the five news tests for the PWRs. One is the median pressure safety injection test, and that's for the US EPWR, and there is a Westinghouse 4-loop plant that's a mid-pressure safety injection system. Another one is for the new emergency letdown system pre-op test on the US APWR. And this pre-op test for ELS performs feed and lead letdown function in combination with the safety injection system function to establish cold shutdown conditions if the normal chemical and volume control system is unavailable due to a safe shutdown seismic event. The

LS directs reactor coolant from the two reactor vessel hot legs, A and D, through four motor-operated valves and these MOVs are actually assigned to the safety injection system. Even though the emergency letdown system is a letdown function, the four valves on that system, either SOS, MOV 032A and B, and 031A and B, and they also perform an ITAAC function for pre-op testing. The ITAAC is 2449(a), and the function is they -- the four motor-operated valves provide water to the refueling water storage pit where the safety injection pumps take suction from the RWST and return the water back to the RCS.

There is also the new AP1000 passive ECCS pre-op tests, there's three of them, see 1F, G, and H. And these ECCS systems use passive natural circulation cooling to cool the core with no operator action for 72 hours. And these AP1000 ECCS pre-op tests verify a number of AP1000 ECCS components performed their test acceptance criteria for things like core makeup tank accumulators, the inside refueling water storage tank piping, squib valves, and the simulated signals and test fixtures may be in place for actuating explosive charges on the squib valves. And those actually are in Reg Guide 1.68, as first of a kind tests.

CHAIRMAN ARMIJO: Frank, just to make sure

I understand. All of these AP1000 tests, were they -- the need for this testing, wasn't that identified either in the certifications of the designs?

MR. TALBOT: Yes, they are. They're in DCD Section 13.2 for all three of those designs.

CHAIRMAN ARMIJO: Okay. So, these are not anything new that we hadn't reviewed before.

MR. TALBOT: No, they're existing information from the DCDs. It was just extracting that information for the new Part 52 plants and make sure we updated a Reg Guide that would appropriately test them.

MEMBER BLEY: That black thing is a microphone.

MEMBER STETKAR: Be careful of that black thing with the green on it.

CHAIRMAN ARMIJO: Yes, the paper just --

MEMBER STETKAR: The paper hits it and makes a reverberating sound.

MEMBER BLEY: And she's got headphones on.

MEMBER STETKAR: We also have the bridge line apparently open. We should get that shut.

CHAIRMAN ARMIJO: So that it's not snapping and making --

MEMBER STETKAR: Frank, before -- I have to

apologize. I didn't make it to the Subcommittee meeting, so I didn't have the benefit of participating in those discussions, so I just naively read through the Reg Guides to prepare for this meeting.

MR. TALBOT: Right.

MEMBER STETKAR: Before you get to 1.79.1, I only had one question about 1.79 itself. In 1.79.1, you seem to be pretty careful when you start talking about verifying actuation of systems regardless of which they are, that the test verifies the signals both from automatic main control room and the remote shutdown panel. 1.79 doesn't ever mention remote shutdown panels. You may want to go back and --

MR. TALBOT: I will say this, Reg Guide 1.68 has the remote shutdown panel testing in it. Okay? Now, this is for pre-op testing, but if you go to Reg Guide 1.68, remote shutdown panel testing, and that's the motherhood Reg Guide.

MEMBER STETKAR: Okay.

MR. TALBOT: Okay. Reg Guide 1.79 and Reg Guide 1.79.1 are cross-referenced in the motherhood Reg Guide, Reg Guide 1.68. So, your question about the remote shutdown panel --

MEMBER STETKAR: You'll pick it up under 1.68.

MR. TALBOT: -- is valid for these Reg Guides, but it's really tested under the motherhood Reg Guide.

MEMBER STETKAR: Okay, thank you. That helps. That was just a discrepancy that I noted --

MR. TALBOT: Okay. Under Reg Guide -- let me go back one because I didn't do the intro here. Okay. And for the Reg Guide 1.79.1, was created to add new ECCS tests for the ABLBR design certification. And, of course, there was a lot of additional lessons learned experience for ECCS testing in the BWRs.

And in Reg Guide 1.79.1., we identified basically eight tests, high-pressure core flooder pre-op test, and the automatic depressurization system test, instrument in flow test and power ascension test for both the ABWR and the ESBWR, the RCIC pre-op flow test and low power test, and the gravity-driven cooling system pre-op instrumentation and flow test. The other four tests that are in Reg Guide 1.79.1 include the isocondenser system test. There's a test for the standby liquid control system, and the ESBWR design has this as part of SLC being classified as part of ECCS. The only plant that does that. And then, of course, all existing BWR plants including the ABWR and the ESBWR design use SLC to mitigate ATWS events

to meeting 10 CFR 50.62. And then there's the low-pressure core flutter system test for the ABWR, and then there's the RHR test, pre-op test and low-power test for the ABWR. And in the ESBWR you have the reactor water cleanup system, shutdown cooling system, low-power test. So you have a heat exchanger, the non-regenerative heat exchanger on the ESBWR design that performs the equivalent RHR function.

MEMBER SKILLMAN: Please watch that microphone. Maybe you want to --

MR. TALBOT: And I'm still hitting it.

MEMBER SKILLMAN: Yes, maybe just move away from it.

MR. TALBOT: Yes. Okay. The Reg Guide 1.79 and 1.79.1 also identified other Reg Guides related to ECCS testing. There is Reg Guide 1.82, and 1.82 provided more prerequisite guidance to evaluate the susceptibility of ECCS suction strainers to debris flow blockage that can affect ECCS pump performance on both PWRs and BWRs.

The engineering evaluation -- and we have in their engineering evaluation should be evaluated for the susceptibility of ECCS suction strainers due to debris flow blockage that can affect required ECCS pump performance and verify that the pumps can perform

their intended safety function over the full range of postulated accident conditions up to and including design-basis accident conditions.

We also have a reference to Reg Guide 1.205, and that contains guidance on coordination and testing of protective breakers to prevent thermal overload of electrical motors. And Reg Guide 1.205 endorses the NFPA Standard 805, which provides additional guidance for coordination and testing of protective breakers.

Both Reg Guides 1.79 and 1.79.1 also have prerequisites that we've added based on -- from the ACRS comments. We have prerequisite guidance due to lessons learned from air entrainment into ECCS system piping, and we've added a reference to RIS 2013-09 which now endorses NEI 09-10. This is brand new. RIS 2013-09 was issued on August 23rd, and the NEI document was issued around April of 2013, but these are brand new guidance documents.

We did have an interim staff guidance document, ISG-19. We took that out because that isn't a document where the ACRS gets a chance to review it. It's guidance we put out on the street, but we've now changed it to a RIS that's been endorsed by SES management, and there's more discussion in the future

on what we'll do with future changes to Reg Guides related to endorsement of NEI 09-10.

There's also lessons learned from --

MEMBER SKILLMAN: Before you go on, that change would be a change that the Subcommittee did not review, so --

MR. TALBOT: That is correct.

MEMBER SKILLMAN: So what --

MR. TALBOT: And, also, previously ISG-19 wasn't from the Subcommittee review back in December 2012, so this is brand new.

MEMBER SKILLMAN: Well, then is it a little bit inappropriate to be asking us to agree to release these when we have not reviewed that?

MR. TALBOT: Maybe I'll let my Branch Chief talk to that issue. It has been endorsed by SES management both in NRR and NRO to use a generic communication to release this RIS with endorsement of the latest version of NEI 09-10.

CHAIRMAN ARMIJO: The question is should we have reviewed it.

MS. KAVANAUGH: Right. The purpose of just mentioning the RIS and NEI 09-10 in the guidance -- by the way, this is Kerri Kavanaugh. What was to address one of the ACRS' questions regarding the air

entrainment. There have been several SERs issued by the staff over the years, typically NRR staff, addressing air entrainment. This is just an intro paragraph to a paragraph of steps that one would take during the pre-op test to make sure that the ECCS was free of gas. It was not an intent to endorse NEI 09-10 in this Reg Guide because that would not be appropriate; yet, the NEI guidance is for the life of the plant for ECCS air entrainment, and we're just looking at one little life cycle of pre-op testing, so the -- we were not trying to have -- pull a fast one on the ACRS in any means. It was just trying to address one of your comments and give you the most recent guidance that the staff had issued that was out on the street.

MR. TALBOT: And that's a fact, it is the most recent guidance. We found out that the RIS was signed out by SES, NRC, NRO, and NRR management August 23rd. And this was the latest thing we had, because we didn't have anything else.

MEMBER SKILLMAN: That certainly was our comment. We were concerned about air entrainment.

MR. TALBOT: Oh, yes, the air -- you were talking all types of gas in safety-related piping and so there's a big, huge paragraph that we had a lot of

good guidance in there, and we were trying to utilize what guidance was out there. We've been following NEI 09-10 for the past year since you made the comments from the December 3rd meeting, so we're looking to resolve this issue to ACRS' satisfaction, and let you know what we can do in the future if you're not satisfied with what we have right now. Because we've had discussions with the Research Branch about the possibility of maybe a new Reg Guide that would endorse the industry standard, but it's still open to discussion by the staff.

MS. KAVANAUGH: Right. If I could point the ACRS to page 4 of Reg Guide 1.79, that first paragraph is exactly what we added to try to address the ACRS comment.

MR. TALBOT: And it's the same in 1.79.1. And it's that big paragraph at the top.

MEMBER STETKAR: My question, because I'm not an attorney and don't want to be an attorney, this sentence says what you've said. It says the RIS endorses the NEI report, but you said well, this Reg Guide doesn't endorse the NEI report.

MR. TALBOT: Well, it's sort of silent. It's prerequisite guidance to do safety evaluation -- to do engineering evaluations before you do the pre-

op test. It doesn't -- it's kind of silent on endorsement. It's just saying this is the NRC staff's latest endorsement of an industry standard using a generic communication which happens to be a RIS. This reg guide doesn't -- actually is silent on endorsement of the NEI guidance. It's talking about the RIS --

MEMBER STETKAR: If I were a naive person reading this, I would say oh, okay, this Reg Guide seems to endorse NEI 09-01 despite the fact that it doesn't say that explicitly.

MR. TALBOT: That's right.

MEMBER STETKAR: But it certainly leads me to believe that the NRC via references in this Reg Guide is endorsing that. And I don't know anything about the NEI report --

MR. TALBOT: That's where we're having our debate. We think a Reg Guide should officially endorse it, but we haven't found an appropriate Reg Guide yet in our big, large pool of Reg Guides that would do that yet.

MS. KAVANAUGH: Frank, this is not the appropriate time.

MR. TALBOT: Okay.

MS. KAVANAUGH: Thank you.

MEMBER SKILLMAN: It seems that maybe to

address what John Stetkar just mentioned, ACRS needs to know that OGC is comfortable with embedding a paragraph that is, in fact, tacit endorsement of an RIS and of an NEI document. As I read the paragraph very quickly, its technical content seems meritorious. It deserved to be there, but I think there's a larger question, and that is what is the legal basis, if this is swept into a newly released revision of a Regulatory Guide?

MR. ORR: Dick, this is Mark Orr. The RIS was reviewed by OGC and approved. And they are currently reviewing this document as we speak. They are scheduled to have their review completed by tomorrow. So, if you want, once I get OGC's comments on the document I can get back with you on that.

MEMBER SKILLMAN: That would be fine. I would find that satisfactory. I would defer to my colleagues, John, got a thought?

MEMBER STETKAR: No.

MEMBER RYAN: I think one way or another it's very important to have clarity. Is it endorsed, or is it not endorsed? Is it just for information only and use it -- you know, buyer beware. I mean, what's --

CHAIRMAN ARMIJO: Remember this is

guidance.

MEMBER RYAN: Or is it guidance which, you know, you can take or leave, or I can either be applauded or criticized for using? You know, it's got to be clear. It's a whole lot better if it is clear.

MEMBER BROWN: How can that first sentence not be endorse. It says NRI -- NRC RIS of 2013-09, NRC endorsement of NEI 09, Revision 1A, Guidelines -- and endorses NEI Topical Report 09. I mean, how --

CHAIRMAN ARMIJO: It's very clear.

MEMBER STETKAR: I thought I understood it until they said well, this Reg Guide doesn't endorse the --

MEMBER BROWN: Well, it does. It says so right here.

MEMBER STETKAR: No, no.

CHAIRMAN ARMIJO: The RIS endorses that.

MR. TALBOT: The RIS endorses it.

MEMBER BROWN: But it says NRC endorses.

MEMBER SKILLMAN: Let's just do this, let's stay cool until we hear what OGC says. If OGC says we're good with this, I think it's fine to be here. It looks like standard language in a lot of Reg Guides, so I'm comfortable. I just want to make sure that in our zeal to be helpful here that we haven't cluttered

up the system.

MR. TALBOT: Okay. Should I continue?

CHAIRMAN ARMIJO: Please.

MR. TALBOT: Okay. And then there was also prerequisite guidance from lessons learned guidance for component testing under Section C.2. And there's prerequisite for SLC system for entry into tech spec mode in which operability is required.

MEMBER STETKAR: Please don't break the microphone, Frank.

CHAIRMAN ARMIJO: Frank, move the microphone.

MEMBER STETKAR: Just either move the microphone, or just --

(Off the record comments.)

MR. TALBOT: Public comments. When DG-1253 was issued for public comments, we did not initially receive any. However, on DG-1277 we received 45 public comments. And they related to the ABWR and the ESBWR. And one general comment from GE was we're not going to build any of the BWR/2-6, and we're only going to build the ABWR and the ESBWR. And GE also provided a significant number of specific comments about ECCS testing guidance related to the ABWR and the ESBWR design certification applications. And then we also

discovered that six public comments later related to both Reg Guides for component testing.

And then we had the December 3rd, 2012 meeting with the ACRS Subcommittee, with Mr. Skillman there as the Chair, and there were 20 comments on Reg Guide 1.79 and 31 comments on Reg Guide 1.79.1. And here's some of the example comments. The Reg Guide should be added to prerequisites for completion of the construction and pre-op tests, make the tests available to NRC inspectors. And here's the question related to gas intrusion, what is an acceptable level of non-condensible gases in ECCS, and shouldn't the evaluation include all types of non-condensible gases? And then there were specific questions about Reg Guide 1.82, and does Reg Guide 1.82 support test acceptance criteria for the Regulatory Guidance in 1.79 and 1.79.1.?

And as a result of the 51 ACRS comments, the staff made a number of revisions for the prerequisite testing on construction tests and pre-op tests in coordination with the startup test approval of test procedures and configuring test initiation. The procedures should be made available to NRC inspectors 60 days before their intended use, similar to statements in Reg Guide 1.68. And then the NRC

staff added the reference to the RIS, and NEI 09-10 to address all types of gas accumulation when evaluating non-condensible gases in ECCS systems. And then the NRC staff added guidance to both Reg Guides supported by guidance in Reg Guide 1.82 to verify test acceptance criteria for ECCS pumps. And this includes adequate flow rates, adequate NPSH, and verified by inspection that there's no debris in the pump suction lines.

Based on that, that concludes my remarks, and the ACRS can ask any other questions they have on the two Reg Guides.

MEMBER BROWN: Can I ask a question?

MR. TALBOT: Sure.

MEMBER BROWN: Yes, on page 8 of the Reg Guide.

MR. TALBOT: Which one?

MEMBER BROWN: 1.79.

MR. TALBOT: Okay.

MEMBER BROWN: It's under flow test, Section F, passive core cooling safety injection. And in item 2.C you say verify proper operation of system valves. Does this include the exploding valves?

MR. TALBOT: Yes, it does include the squib valves. And it also --

MEMBER BROWN: Are they going to all be actuated to confirm that they operate?

MR. TALBOT: Absolutely not.

MEMBER BROWN: It's not being confirmed that they operate --

MR. TALBOT: You put them in a test fixture and you test a sample.

MEMBER BROWN: Test the -- no, you only test the trigger, that's all.

MR. TALBOT: Yes.

MEMBER BROWN: So you have no idea whether the valve actually operates or not.

MR. TALBOT: Well, it refers to C.2.b.

MEMBER BROWN: I looked for C.2.b and couldn't find it.

MR. TALBOT: It's there.

MEMBER BROWN: Where is C?

MR. TALBOT: Keep going. C.2.b is for component testing, and then if you go there you'll find a lot --

MEMBER BROWN: That's Section 2.

MR. TALBOT: Right. C.2 is for component testing, and then if you go under b you'll get the valves.

MEMBER BROWN: C.2?

MR. TALBOT: C.2.b, page 10.

MEMBER BROWN: I've got, I'm right there.

MR. TALBOT: Page 10. And you'll see the pyrotechnic-actuated squib valve says C.2.b.2.

MEMBER BROWN: All right. So, C is way back here. That's what I was --

MR. TALBOT: Yes, sir.

MEMBER BROWN: Way back at the beginning several pages earlier. So, this is a circumstance where we test but not test the valve to see that it operates.

MR. TALBOT: There's also guidance in 1.68 for first of a kind test on squib valves.

MEMBER BROWN: Yes, I'm well aware of those. I've already made plenty of comments against the exploding valves.

MR. TALBOT: We also have Tom Scarborough here if you'd like to talk more specifics about the testing in these Reg Guides, as well as in 1.68 related to the squib valves.

MEMBER BROWN: You don't have to say any more. I just wondered if based on what you said you have somebody who's actually going to accentuate them, and the answer is you're not. You're doing just the trigger.

MR. TALBOT: Test the trigger.

MEMBER BROWN: On a sample, the sample basis. You don't even do all the --

MR. TALBOT: You it in a test fixture --

MEMBER BROWN: Yes, I'm well aware of that.

MR. TALBOT: Okay.

MEMBER BROWN: I got it.

MR. TALBOT: You got it.

MEMBER BROWN: Okay.

MEMBER BANERJEE: Since Charlie has been asking this for about three years --

MEMBER BROWN: What was that?

MEMBER BANERJEE: You've been asking this question for three years.

MEMBER BROWN: Well, yes, because they're unqualified. They're using an unqualified and untested valve in a brand new designed plant. That's really super, isn't it? And this doesn't help.

MEMBER STETKAR: Frank, a couple of questions. One -- and this is something I just don't know. This is Reg Guide 1.79.1. When you talk about testing the isolation condenser, this is a high-level question so I don't want to get into words here. Are there design constraints on the isolation condenser that limit the amount of cool down that the isolation

condenser can apply? The test examines each train of the isolation condenser one at a time to verify that it can remove its design licensing basis amount of heat. There has been some indication from a plant that oh, used to operate in Japan, that excessive cool down rates might not necessarily be a good thing, but I don't know whether the ESBWR design criteria for the isolation condenser says you have to have the ability to remove more than X, and less than Y heat.

MR. TALBOT: You're talking about the delta for cool down rates --

MEMBER STETKAR: Right.

MR. TALBOT: -- that should be with --

MEMBER STETKAR: And I don't know whether that's part of the design specification.

MR. TALBOT: The low power test is a hot condition test. It's currently in the 20 percent range. I've seen it in 20-30 percent range for even some of the current fleet of BWR2s that have it, and one BWR3 design. We can verify for you if there's a range that they should be tested in under the power ascension --

MEMBER STETKAR: That's what I'm asking, but it's not one at a time. It's let's open under what we hope would be expected accident response conditions

all of the isolation condensers simultaneously would be actuated, and they would all immediately start removing heat, not one at a time.

MR. TALBOT: You're talking about all -- I believe two trains or four trains?

MEMBER STETKAR: Four.

MR. TALBOT: Four trains.

MEMBER STETKAR: Yes. Yes.

MR. TALBOT: We may have to check on that for you.

MEMBER STETKAR: But I just don't -- I don't know whether that's a design -- this is a lack of information on my part, and I didn't have enough time to --

MR. TALBOT: This would be I believe for ESBWR only, talking about --

MEMBER STETKAR: Only -- yes, that's right.

MR. TALBOT: Bigger plant design at 4500 megawatt thermal so that if you go in --

MEMBER STETKAR: It's the one with the isolation condenser, too.

MR. TALBOT: Yes, so it's going to be bigger heat loads.

MEMBER STETKAR: Yes. But it's just a question that I came up, and I didn't have a chance to

go back through the ESBWR design certification to see if there was also a limit on maximum cool down rate achievable from all four isolation condensers. If there is, there ought to be a test to make sure that you're under that, if there's some sort of limit. If there isn't, and I'm assuming some smart people did some really smart thermal hydraulic analyses to show that that can't get you into trouble.

CHAIRMAN ARMIJO: Well, you can overcool a vessel.

MEMBER STETKAR: I'm not worried, necessarily, about overcooling the vessel. I'm worried about having operators say things like oh, my God, I've got to isolate this thing because I'm cooling down too fast, when they ought not to isolate it.

CHAIRMAN ARMIJO: And turn it off, yes.

MEMBER STETKAR: Turn it off.

MR. TALBOT: I can check the ESBWR design certification application to see what's there for cool down rates on all four trains.

MEMBER STETKAR: See, we looked at -- I know it was looked at, does one get you enough. The question is does four get you --

CHAIRMAN ARMIJO: Too much.

MEMBER STETKAR: -- really too much. And

if there's a limit on that.

MR. TALBOT: As I remember, there's a first of a kind test on the isocondenser system. And I remember it, it's the Section .35, there's a special first of a kind test for the isocondenser system. I can check that to make sure we appropriately captured that information. I thought we did.

MEMBER STETKAR: I don't know. It's just a question I had, again, as I was reading through this, and I --

MR. TALBOT: Power ascension test, I do remember that because I wrote the safety evaluation for the ESBWR design certification.

MEMBER STETKAR: Okay.

MEMBER SKILLMAN: Well, let's get an answer.

MR. TALBOT: Yes, I can follow-up on that for you.

MEMBER STETKAR: The other question I have, also, if -- is -- and this is ABWR, and it's -- I don't have the page number here. It's easier. On 1.79.1, and it's page 14, I guess, yes. Maybe you changed it. Did you? Hang on a second. Let me -- no, okay. Under H.1, and I didn't get a chance to read -- perhaps you caught this. I'm not quite sure, so let

me just read it.

The concern I had -- oh, no. H.1.C, the paragraph right at the bottom of the page there, it says, "Verify proper operation of RHR system during shutdown cooling. Verify adequate NPSH to the RHR pumps from the suppression pool." Now I recognize this is during cold, but in many plants the most limiting NPSH, especially because this refers to shutdown cooling, is that the shutdown cooling mode when you're taking suction from the hot leg. So, I'm not sure how you're verifying that it will be okay in that cooling mode under cold conditions by taking suction from the suppression pool.

MR. TALBOT: So, what you're saying is should there be a test under -- flow test under low power test.

MEMBER STETKAR: Well, here you're verifying adequate NPSH, and because these plants -- because the RHR pumps perform the double low-pressure core injection and RHR functions, the verifying that the —-- those pumps have adequate NPSH for both of those functions, one is from the suppression pool. That's usually not too much of a problem. There may be a problem during the shutdown cooling mode which this part of the testing says is supposed to be verified,

it says during shutdown cooling mode, which is hot leg suction. And, yet, I couldn't find anything in the low-power hot conditions that actually verified that they have adequate NPSH in that cooling mode. It's all during cold, and it's all during -- it's all from the suppression pools, and it's all done during cold.

MR. TALBOT: Possibly H.1.c belongs under H.2.

MEMBER STETKAR: It may as -- but if it is, you still want to change from the suppression pool to from the hot leg. Right? You want to line it up.

MR. TALBOT: Yes.

MEMBER STETKAR: To take away heat, and make sure it's got adequate NPSH. Now, in principle if you get that far and you're on RHR and the pumps are blasting themselves to bits, you probably have done the test, but --

MR. TALBOT: So, I'm going to take this question as it appears to you that Test H.1.c may need to be moved to H.2?

MEMBER STETKAR: It's just any place where it says in here pre-operational test to verify NPSH for the shutdown cooling mode, I'd say just double check that you're not telling them to line it up to the suppression pool to verify NPSH for that mode.

MR. TALBOT: Okay.

MEMBER STETKAR: Okay? You can do the cold part of it lined up to the hot leg, you know, to verify differential head, at least, in terms of piping losses, and valve losses, and all that kind of stuff. If you're cold, you know, once you go on RHR, so you could, in principle, do it cold just for the static head loss and the -- pump the piping friction, but not lined up to the suppression pool. Follow me?

MR. TALBOT: Okay. Yes. It should not be lined up to the suppression pool in the shutdown cooling mode?

MEMBER STETKAR: Well, the shutdown cooling mode is typically taking a suction from the hot leg.

MR. TALBOT: Right.

MEMBER STETKAR: Cooling it down, putting water back into the -- I don't know what -- I don't remember what it's lined up to the feedwater line or someplace going back into the vessel. And in many plants that I've seen, that configuration is the most limiting configuration for NPSH for those pumps. And reading through this

MR. TALBOT: That's off the hot leg and not the suppression pool.

MEMBER STETKAR: Right, because of the

difference in elevation head and the difference in the size of the lines, and you've got a couple of valves and all of that, you know, that you don't have when you're taking suction from the suppression pool. Because see under G, you verify adequate NPSH under th low-pressure core, whatever they call it, flooding mode, which is a suction from the suppression pool. So, I didn't have any problems with that, but it's just under H where it's the different mode of operation.

MR. TALBOT: Okay, we will verify --

MEMBER STETKAR: Just double check that.

MR. TALBOT: -- that H.1.c is properly following the design certification application information as well as if it's written right for line up.

MEMBER STETKAR: Yes, for line --

MR. TALBOT: Now that raises a question for me, if I somehow captured this information from the DCD and is there any --

MEMBER STETKAR: I don't know. As I said, I didn't -- I read this stuff --

MR. TALBOT: Okay, we will address your concern.

MEMBER STETKAR: -- yesterday.

MEMBER SKILLMAN: John, thank you. Any other comments here for Frank? Okay. Are there any questions the Members want to raise, or any other comments? Is the bridge line open? Zeyna, would you check on the bridge line, please?

MS. ABDULLAHI: No, it's not open. It's closed. Are they on line?

MEMBER SKILLMAN: Would you open it up, please, see if anybody is there. Hello, is the bridge line open? Is anybody there? If someone is there will you please identify yourself.

CHAIRMAN ARMIJO: Pretty quiet.

MEMBER SKILLMAN: Try one more time, anybody on the bridge line, please.

CHAIRMAN ARMIJO: I think you're not a best seller.

MEMBER SKILLMAN: Okay. Thank you, Theron. Close the bridge line. Are there any final comments anybody would like to make?

Frank, let me ask this, what -- or Kerri, what action are you looking for from the ACRS, please?

MS. KAVANAUGH: I think what we're looking for is to get ACRS acceptance of Reg Guide so that we can publish it for final issuance.

MEMBER SKILLMAN: So, you're looking at it

for a memo or a short letter identifying that the work has been completed and we are in agreement with releasing these for use?

MS. KAVANAUGH: And that we've addressed all of your comments that we received back in December.

MEMBER SKILLMAN: Okay, I can confirm that the 51 comments that the ACRS members made have been appropriately incorporated, and we have three from today. One is OGC, we need -- I want to know about that before we say go ahead.

MS. KAVANAUGH: Right.

MEMBER SKILLMAN: The second is John's question regarding the ESBWR testing for the --

MS. KAVANAUGH: Condenser.

MEMBER STETKAR: Isolation condenser.

MEMBER SKILLMAN: -- passive cool down, iso cooling.

MS. KAVANAUGH: Right.

MEMBER SKILLMAN: And the third is Frank giving us guidance as to whether or not the placement of H.1.c is appropriate. So, once we hear back from you, we will be prepared to write a letter.

MS. KAVANAUGH: Thank you.

MEMBER SKILLMAN: Any other comments?

MR. TALBOT: Well, three questions are a lot easier to handle than 51.

CHAIRMAN ARMIJO: Depends on the questions.

MEMBER SKILLMAN: With that, Frank, thank you, Mark and Kerri, thank you. Mr. Chairman, back to you.

CHAIRMAN ARMIJO: Okay. Thanks, Dick. I think we're going to try and catch up. I'd like to stay in session and go move into letter writing, and finish up the Monticello letter.

COURT REPORTER: Are we off the record?

CHAIRMAN ARMIJO: Yes, we should go off the record and go onto letter writing and deal with Monticello, and get that done this evening.

(Whereupon, the proceedings went off the record at 3:42:12 p.m.)

Monticello Nuclear Generating Plant
Extended Power Uprate

Advisory Committee on Reactor Safeguards

607th Committee Meeting

September 5, 2013

Monticello Nuclear Generating Plant

Extended Power Uprate

Introduction

Mark Schimmel
Vice President Xcel Energy

NSPM ACRS Committee Presenters

- **Mark Schimmel – Vice President Xcel Energy**
- **Nate Haskell – Monticello Engineering Director**
- **Rick Stadtlander – Monticello Operations Support Manager/Shift Manager**
- **Steve Hammer – Monticello EPU Licensing Project Manager**

Monticello EPU Overview

EPU Overview

Plant Modifications

Margin Improvement

EPU Overview

Monticello Nuclear Generating Plant Overview

Operating License issued on September 8, 1970

Commercial Operation commenced on June 30, 1971

Full Term Operating License was issued on January 9, 1981

GE BWR 3 - Mark I Containment

OLTP Limit	**1670 MWt**
Initial Plant Rerate Implemented in 1998 (CLTP)	**1775 MWt**
20% OLTP (12.9% CLTP) EPU Planned for 2013	**2004 MWt**

EPU Project Team Staffed with Personnel Having Extensive BWR Plant Experience

EPU Overview

Monticello Nuclear Generating Plant Overview

- EPU application based on GEH Extended Power Uprate Licensing Topical Reports
  - NEDC-32424 (ELTR-1)
  - NEDC-32523 (ELTR-2)
  - NEDC-33004 (CLTR)
  - NEDC-33173 (IMLTR)
- Constant reactor pressure uprate
- 12.9% CLTP EPU considered optimum for design, fuel cycle capabilities and operating margins

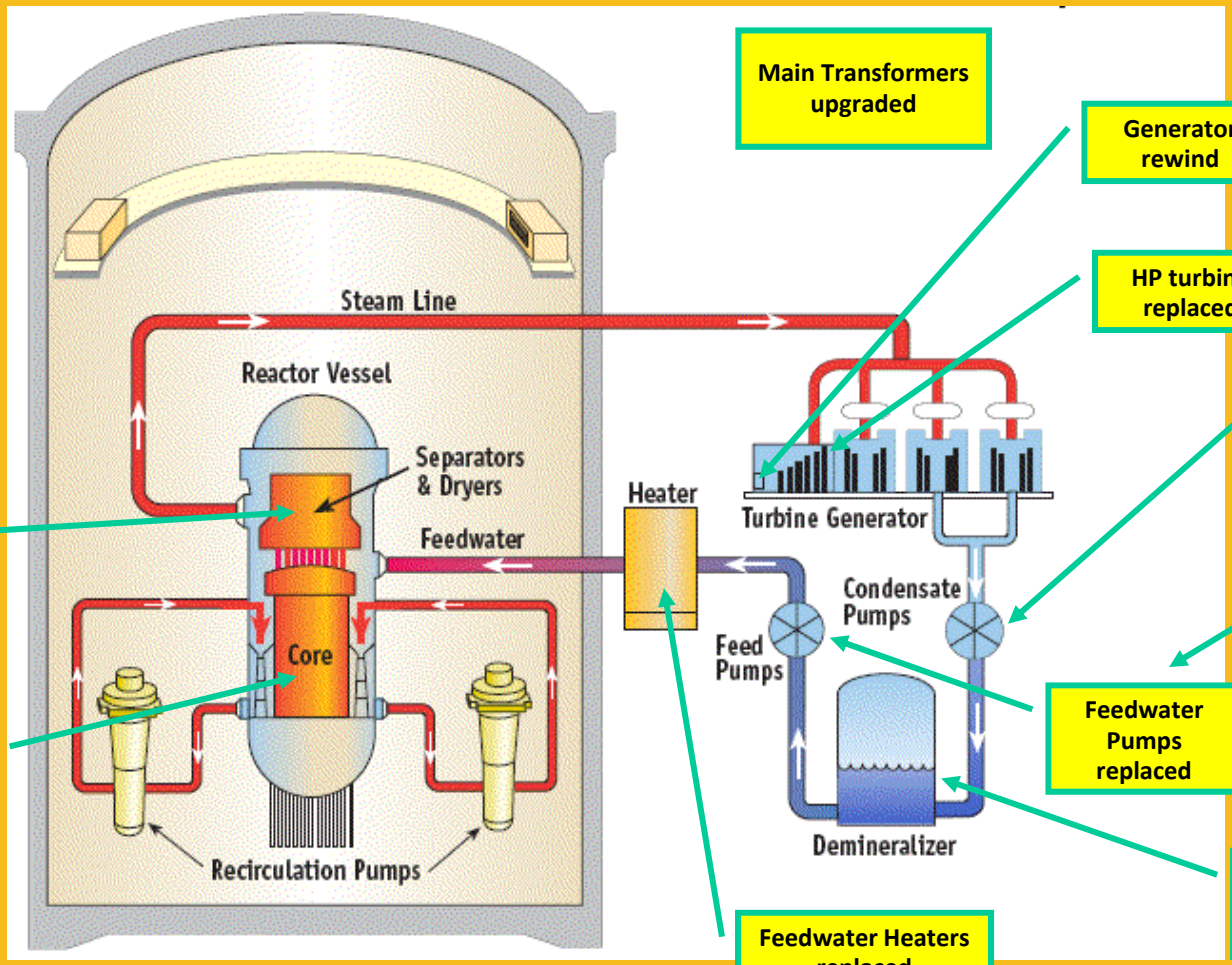
EPU Overview

Overview of Major Parameter Changes

Parameter	CLTP	EPU
Core Thermal Power (MWt)	1775	2004
Full Power Core Flow Range (Mlbm/hr)	47.5 - 60.5	57.0 - 60.5
Full Power Core Flow Range (% Rated)	82.4 - 105	99 - 105
Steam Dome Pressure Limit (psia)	1025	1025
Vessel Steam Flow (Mlbm/hr)	7.26	8.34
Feedwater Flow Rate (Mlbm/hr)	7.24	8.31
Final Feedwater Temperature (ºF)	383	402

Plant Modifications

Overview of Major Modifications



Main Transformers upgraded

Generator rewind

HP turbine replaced

Condensate Pumps replaced

Steam Dryer replaced

Added 13.8 KV Power Supply

Feedwater Pumps replaced

Reactor Core Power increased

Condensate Demineralizers replaced

Feedwater Heaters replaced

Plant Modifications

Major EPU Modifications to Improve Reliability and Operating Margins

Steam Dryer Replacement

FW Heater Replacements

FW Pump and Motor Replacement

Condensate Pump and Motor Replacement

Condensate Demineralizer Replacement

MG Set Motor Replacement

High Pressure Turbine Replacement

Generator Field and Stator Rewind

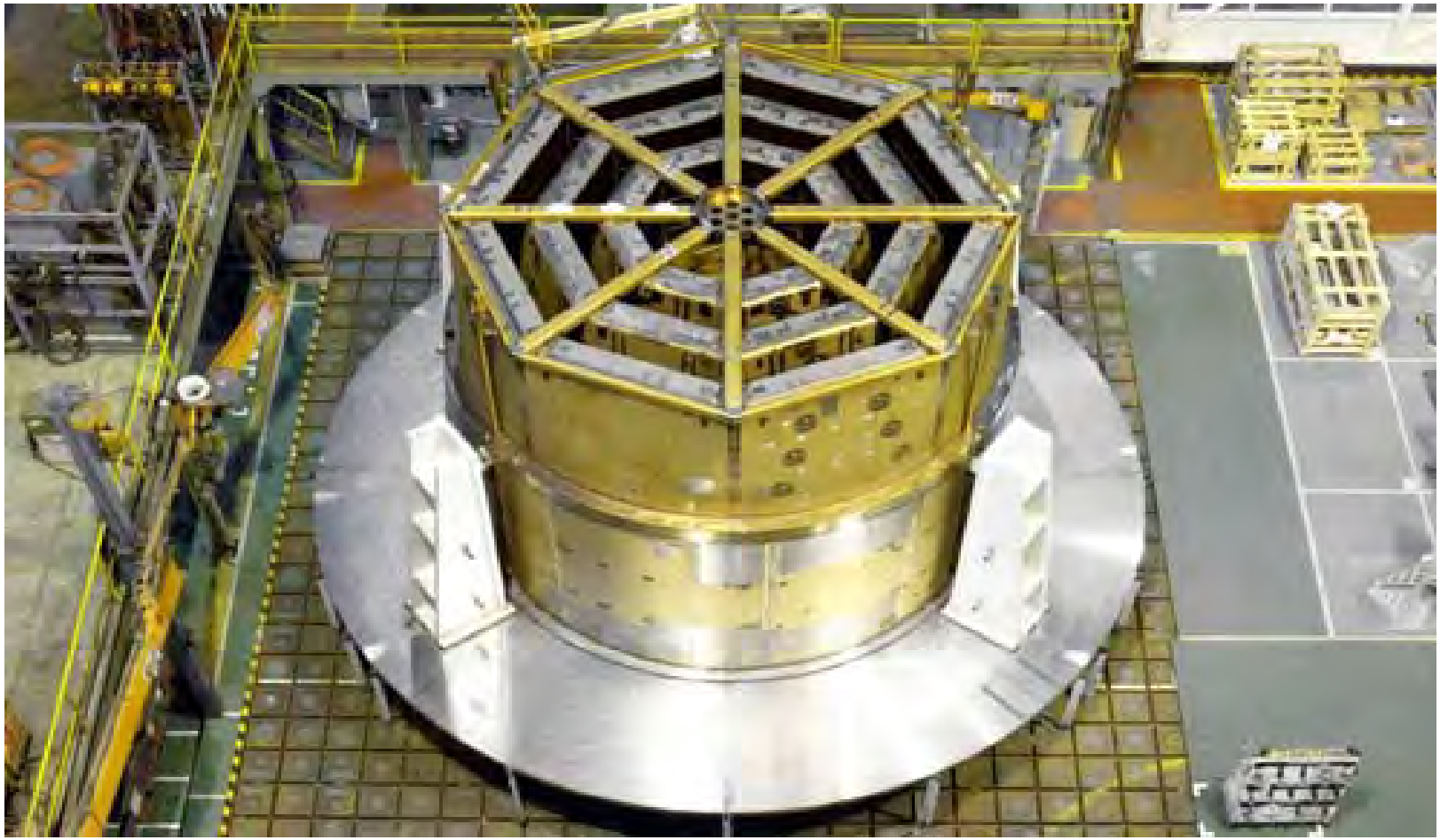
Transmission System Upgrades (1AR Replacement)

Main Transformer

13.8KV Bus and Transformers

Plant Modifications

Replacement Steam Dryer



Plant Modifications

New Feedwater Heaters

Plant Modifications

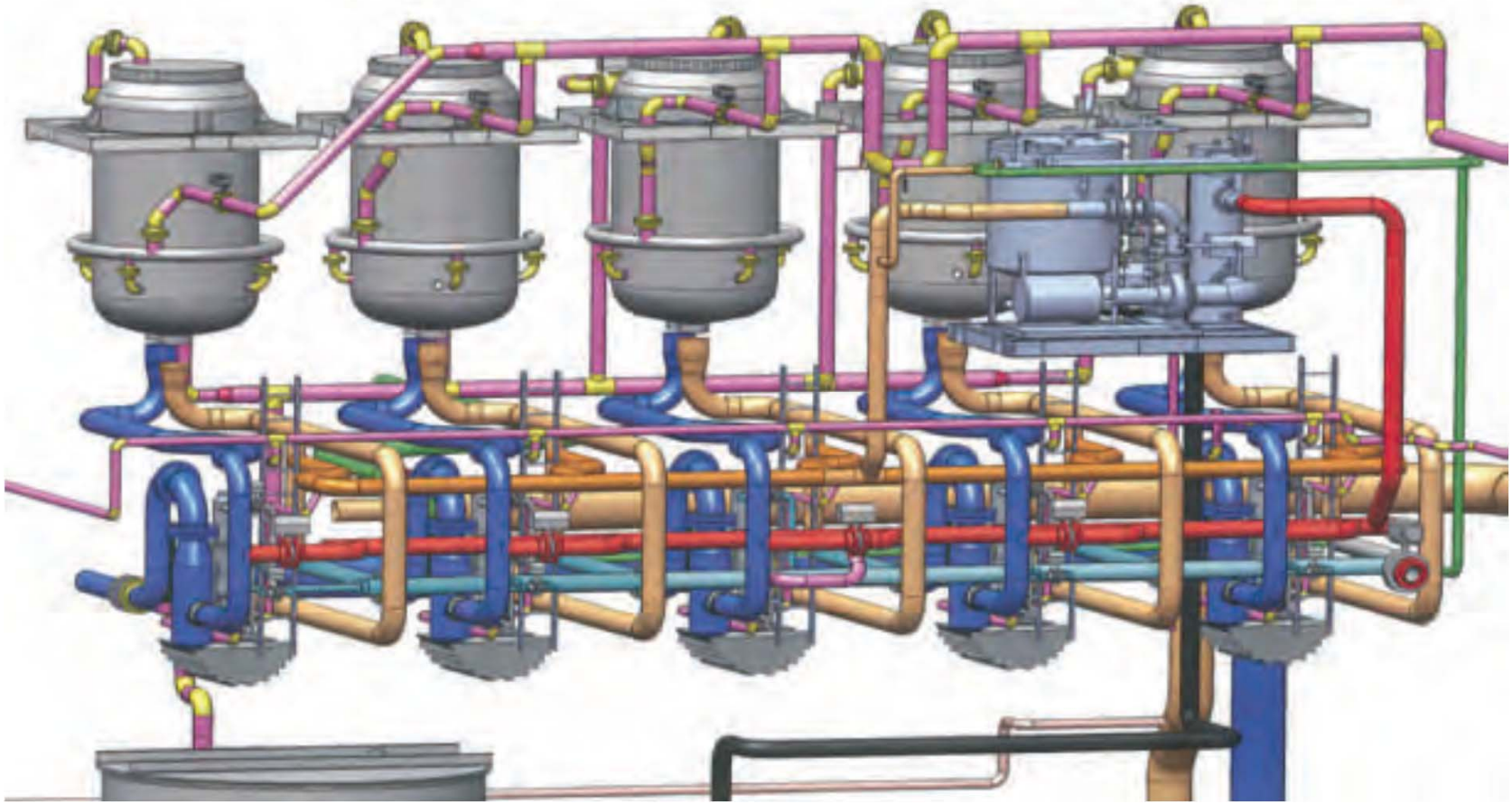
New Feedwater Pumps and Motors

Plant Modifications

New Condensate Pumps and Motors

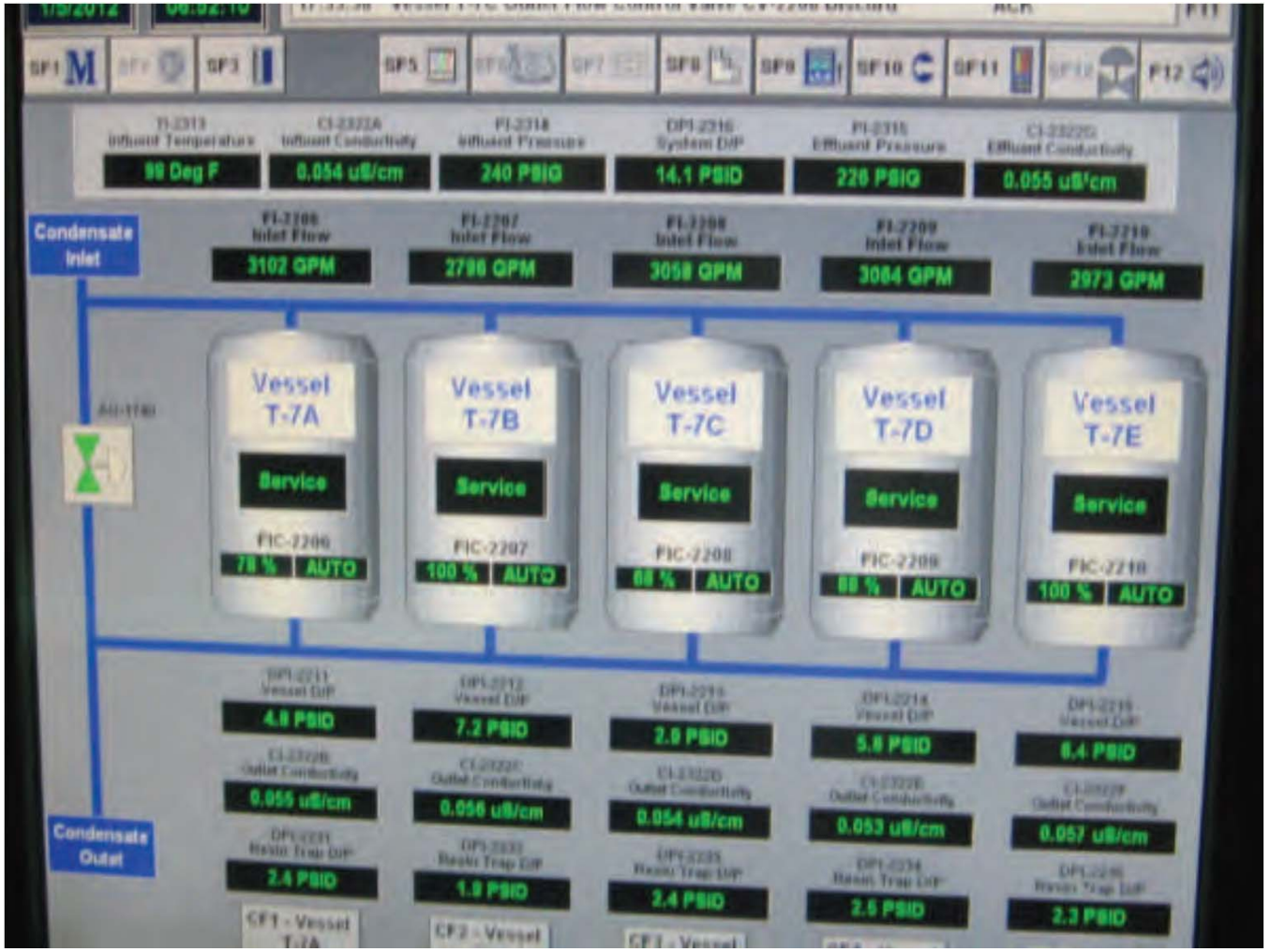
Plant Modifications

Condensate Demineralizer Replacement



Plant Modifications

Condensate Demineralizer Replacement

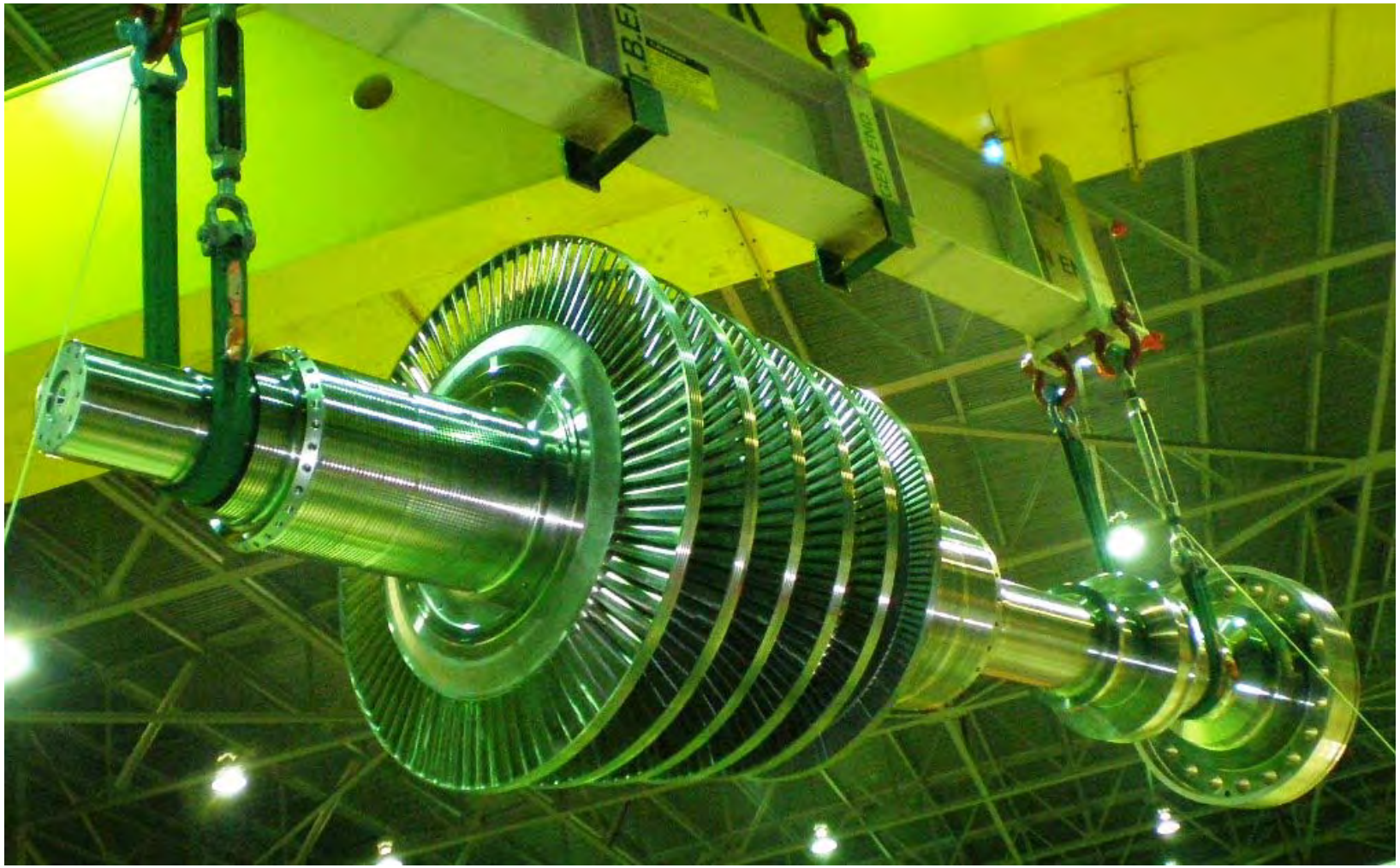


Plant Modifications

MG Set Motor Replacement

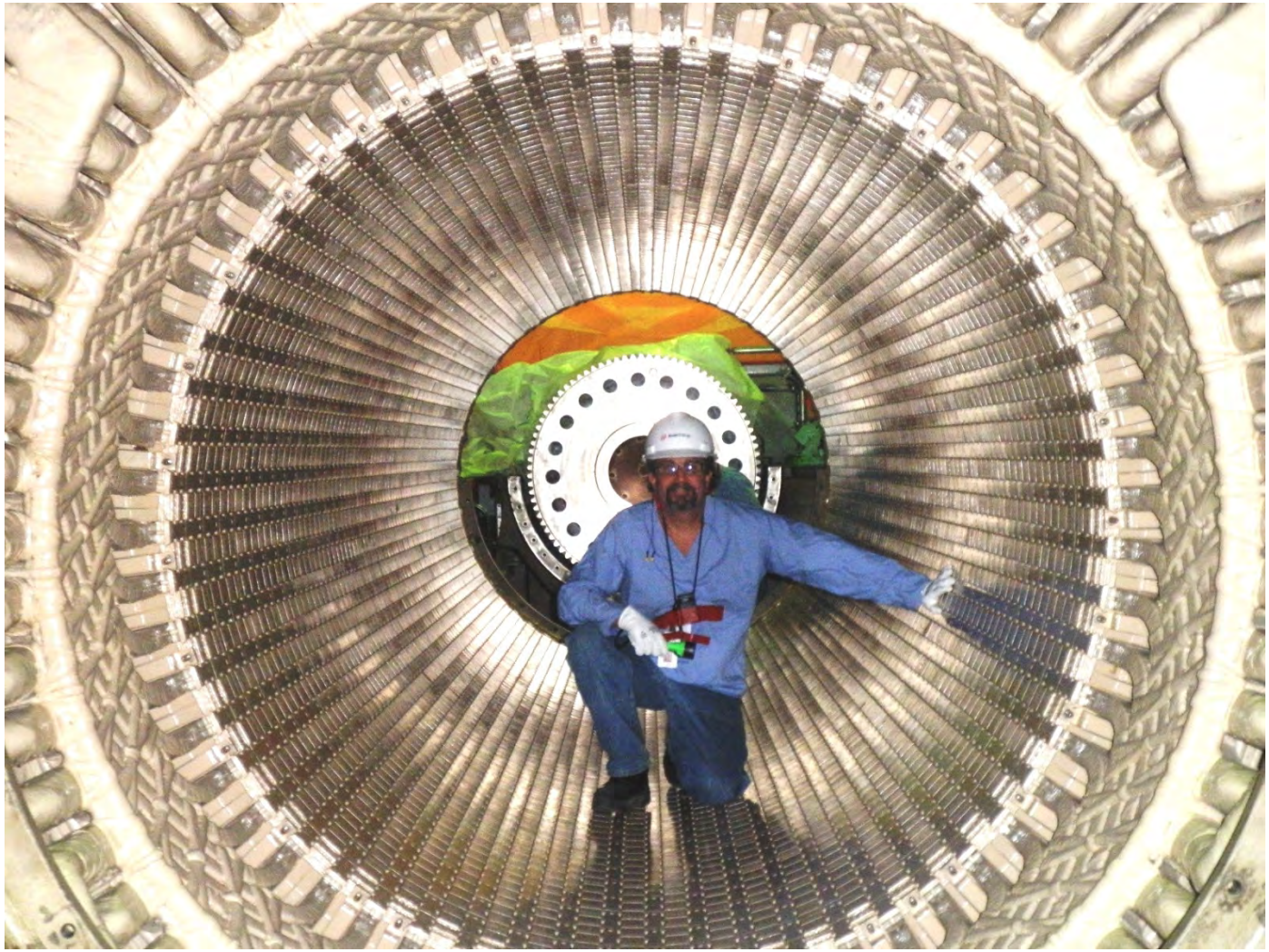
Plant Modifications

New High Pressure Turbine



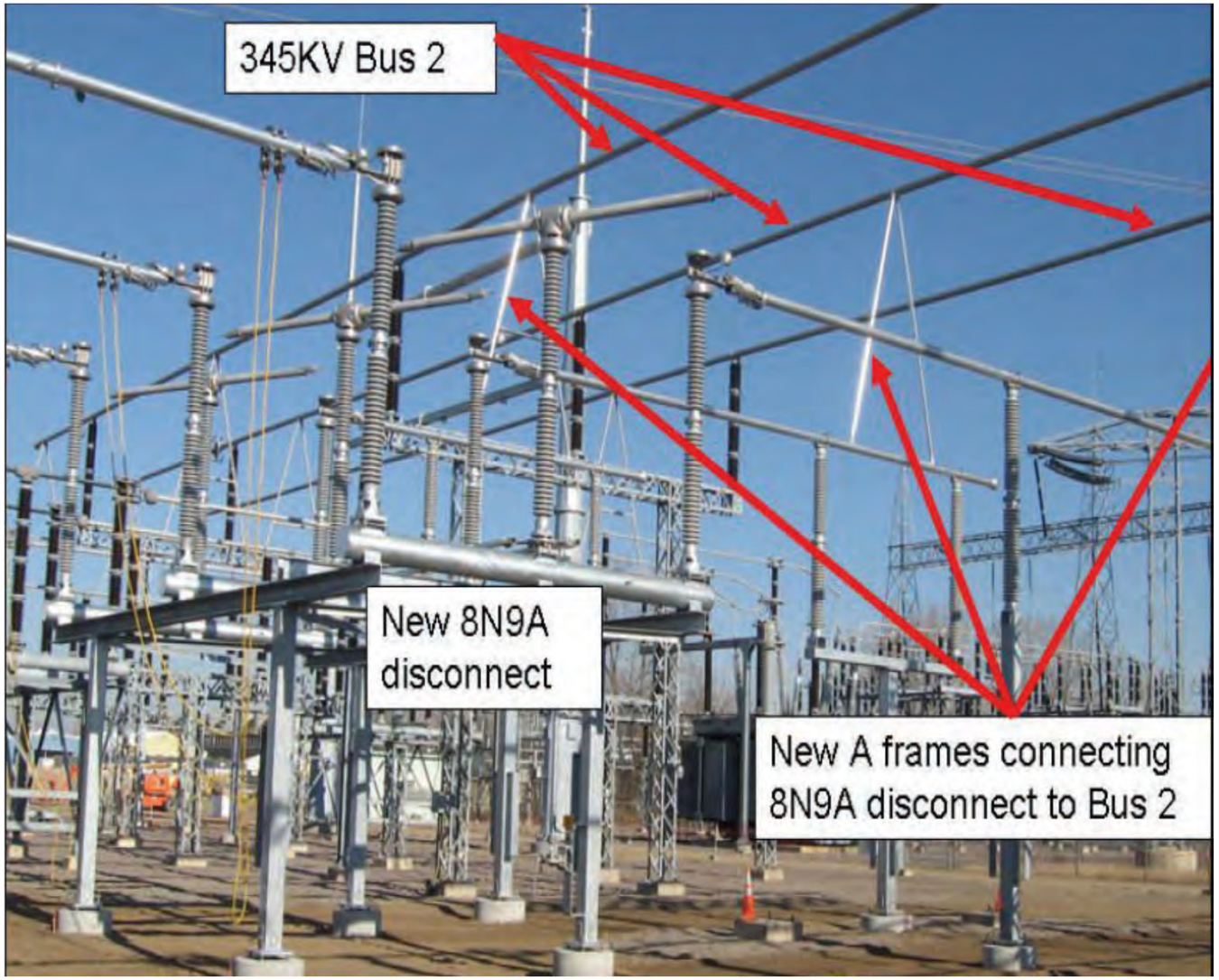
Plant Modifications

Generator Rewind



Plant Modifications

Transmission System Upgrades



Plant Modifications

Transmission System Upgrades

Plant Modifications

New Main Transformer

Plant Modifications

New Auxiliary Transformers for 13.8 KV

Plant Modifications

13.8 KV Busses

Margin Improvement

Margin Improvement

- **Additional Margin Improvements**
  - **HELB Barrier for lower 4KV room**
  - **Condensate Demineralizer outlet valve failure position**
  - **#11 SW pump relocated to diesel backed power source**
  - **Instrument Air system upgrade**
  - **RWCU Pumps Replaced**
  - **Generator Exciter Replacement**
  - **Isophase Bus coolers**

Margin Improvement

- **Program Improvements**
  - **HELB Analysis – Updated to include EPU conditions and latest industry standards**
  - **MOV/AOV Analysis – Updated to include EPU and HELB program changes**
  - **EQ Analysis – Updated to include EPU and HELB program changes**

Transient & Accident Analyses

Margins for Limiting Events

Criteria	Limiting Event	Result CLTP / EPU	Limit CLTP / EPU
Suppression Pool			
–Temperature (AOO events)	App R	193 / 195.4 ºF	197.6 / 212 ºF
	ATWS (LOOP)	186.7 / 188.8 ºF	
	SBO	151.2/ 175.5 ºF	
–Temperature (w/debris)	DBA (LOCA)	194.2 / 207.1 ºF	
– Pressure	DBA (LOCA)	31.2 / 32.7 psig	56 psig
Drywell			
– Temperature	MSLB (SBA)	335 / 338 ºF*	335 / 338 ºF (air)
		273 / 278 ºF	281 ºF (wall)
– Pressure	DBA (LOCA)	39.5 - 43.4 / 44.1 psig	56 psig
Core Parameters			
– Peak Clad Temperature	DBA (LOCA)	2140 / 2140 + 10 ºF	2200 ºF
– Peak Vessel Pressure	MSIVC	1296 / 1335 psig	1375 psig

*** Use of revised analysis inputs increased CLTP results as shown.**

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Advisory Committee on Reactor Safeguards
607th Meeting

Monticello Nuclear Generating Plant
Extended Power Uprate

September 5, 2013

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Opening Remarks

John Monninger

Deputy Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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Introduction

Terry Beltz

Senior Project Manager
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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Topics

- EPU Overview
- Plant Modifications / Safety Margin Improvement
- Containment Review / Containment Accident Pressure
- Steam Dryer Review and Analysis
- Additional Topics for Discussion

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Monticello Nuclear Generating Plant
Extended Power Uprate
ACRS Subcommittee Meeting

Containment Accident Pressure

Ahsan Sallman

Containment and Ventilation Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

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Contents

- Regulatory Requirement
- Monticello EPU CAP Needs & Staff Guidance for Using CAP
- Summary of Key CAP Items Evaluated by Staff
- CAP Credits
- Conclusions

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Regulatory Requirement

To satisfy AEC proposed GDCs applicable to Monticello- equivalent to current GDC-38, "Containment Heat Removal", the Core Spray (CS) and Residual Heat Removal (RHR) pumps should have adequate NPSHa during the design basis accident and non design basis events.

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Monticello EPU CAP Needs & Staff Guidance for Using CAP

- **CAP Credit is needed to support CS and RHR pumps NPSHa analysis for:**
  - **Design Basis LOCA**
  - **Small Steam Line Break Accident**
  - **ATWS Event**
  - **Appendix R Fire Event**
- **CAP credit not needed for SBO event**
- **Licensee satisfactorily responded to staff guidance in Sections 6.6.1 through 6.6.10 in Enclosure 1 of SECY-11-0014**

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Summary of Key CAP Items Evaluated by the NRC Staff

- Conservative LOCA containment NPSHa analysis using the conservative SHEX code
- Statistical LOCA containment NPSHa analysis using the conservative SHEX code
- Realistic LOCA containment NPSHa analysis using best-estimate GOTHIC code; realistic inputs met 98% of time
- Increased NPSHa Margin observed on comparing conservative and statistical analysis results
- For DBA LOCA analysis, increased NPSHr by including uncertainty
- Required CAP Credit in realistic analysis:
  - 70% of required CAP credit from statistical analysis
  - 50% of required CAP credit from conservative analysis

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Summary of Key CAP Items Evaluated by the NRC Staff (cont'd)

- On-line containment leakage monitoring method
- For worst "Appendix R Fire", when CAP is needed:
  - containment integrity is maintained
  - modification performed to preclude MSO
  - followed NEI 00-01 R2 endorsed by RG 1.189 R2
- No new operator actions
- Zone of maximum erosion (NPSHa between 1.2 and 1.6) satisfactorily addressed by pump manufacturer (Sulzer)
- Pump mission time for DBA LOCA and non-DBA events until the CAP credit is not needed evaluated and results are acceptable.

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CAP Credits

Accident /Event	Most Limiting Pump	Maximum CAP Credit (psig)	CAP available when maximum CAP is needed (psig)	Duration of CAP need (hours)	Minimum NPSHa for the most limiting pump (feet)	NPSHreff (1) (feet) NPSHr3% (2) (feet)
DBA-LOCA (long term)	CS	9.1	10.0	126.4	30.2	28.2 (1)
ATWS	RHR	6.2	9.6	7.6	23.9	23.5 (2)
App R Fire with SORV	RHR	3.3	7.0	28.7	31.2	23.5 (2)
App R Fire, No SORV	RHR	3.1	6.8	28.8	31.0	23.5 (2)

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Conclusions

- **CAP is credited to NPSHa analysis for CS and RHR pumps for DBA and non-DBA events.**
- **Conservative LOCA containment NSPHa analysis is the licensing basis analysis.**
- **Staff guidance in SECY-11-0014 for the use of CAP is satisfied.**
- **Staff considers the use of CAP in NSPHa acceptable for the Monticello EPU.**
- **No comments received from ACRS Power Uprate Subcommittee**

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Questions

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ACRONYMS

ACM - Acoustic Circuit Model

ACE - Enhanced ACM

ASME – American Society of Mechanical Engineers

B&Us - Bias errors & Uncertainties

CLTP - Current Licensed Thermal Power

BUF - Bumpup Factor

FEA - Finite Element Analysis

EPU - Extended Power Uprate

MNGP- Monticello Nuclear Generating Plant

fps - feet/second

OLTP - Original Licensed Thermal Power

MSL - Main Steam Line

QC2 - Quad Cities, Unit 2

PATP - Power Ascension Test Plan

RRP- Reactor Recirculation Pump

RSD - Replacement Steam Dryer

SG - Strain Gages

SCF - Stress Concentration factor

SPM - Skirt Protection Model

SMT-Scale Model Tests

VPF-Vane Passing Frequency

SRV-Safety Relief Valve

WEC – Westinghouse Electric Corp.

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Additional Topics for Discussion

Xcel Energy and NRC Staff

Address any additional questions from ACRS member associated with review of the Monticello EPU

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Public Comments

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Committee Comments

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Adjourn

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RISK-INFORMING THE REACTOR OVERSIGHT PROCESS FOR NEW REACTORS

Advisory Committee on Reactor Safeguards
Full Committee Meeting

Contacts: Ron Frahm, NRR/DIRS, 301-415-2986
Jeff Circle, NRR/DRA, 301-415-1152
Eric Powell, NRO/DSRA, 301-415-4052
Mike Balazik, NRR/DIRS, 301-415-2856

September 5, 2013

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Background

- SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors,” issued June 2012 to provide staff recommendations on both licensing and oversight processes
- Tabletop exercises indicated that current risk thresholds are appropriate for ROP; however, a few changes may be warranted consistent with integrated risk-informed principles in RG 1.174
- Staff recommended Option 3B; to augment existing risk-informed ROP tools with deterministic backstops to ensure an appropriate regulatory response for the new reactor designs

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Commission SRM Dated October 22, 2012

- The SRM states, in part, that the Commission has disapproved the staff's recommendation (Option 3B) related to the ROP
- The staff should give additional consideration to the use of relative risk metrics, or if the staff believes that this is not a viable option for new reactor oversight, it should provide a technical basis for its conclusions.
- The staff should provide the Commission with a notation vote paper that provides:
  1. A technical basis for the staff's proposal for the use of deterministic backstops, including examples
  2. A technical evaluation of the use of relative risk measures, including a reexamination of the pros and cons
  3. A discussion of the appropriateness of the existing performance indicators and the related thresholds for new reactors

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Staff Approach

- Deliverable is a Notation Vote SECY for EDO signature in October 2013
- Involve internal and external stakeholders, including Industry, ACRS, and public
- Stay within scope of the request (provide technical basis and discussion) and do not try to fully develop the backstops, relative risk approach, etc.
- Provide a crisp paper with enough detail to provide the Commission the information they need to direct the staff appropriately, with supporting details in 4 enclosures
- The LRF history and independent review portions of SRM are not within the scope of this paper

Draft SECY Outline

- “Recommendations for Risk-Informing the ROP for New Reactors” – Summary, Conclusions, and Recommendations
- Encl. 1 - Background and History of Correspondence
- Encl. 2 - Technical Basis and Examples of Integrated Risk-Informed Approach Using Qualitative Measures
- Encl. 3 - Technical Evaluation of Relative Risk Measures and Reexamination of Pros and Cons
- Encl. 4 - Discussion of Appropriateness of Existing Performance Indicators and Thresholds

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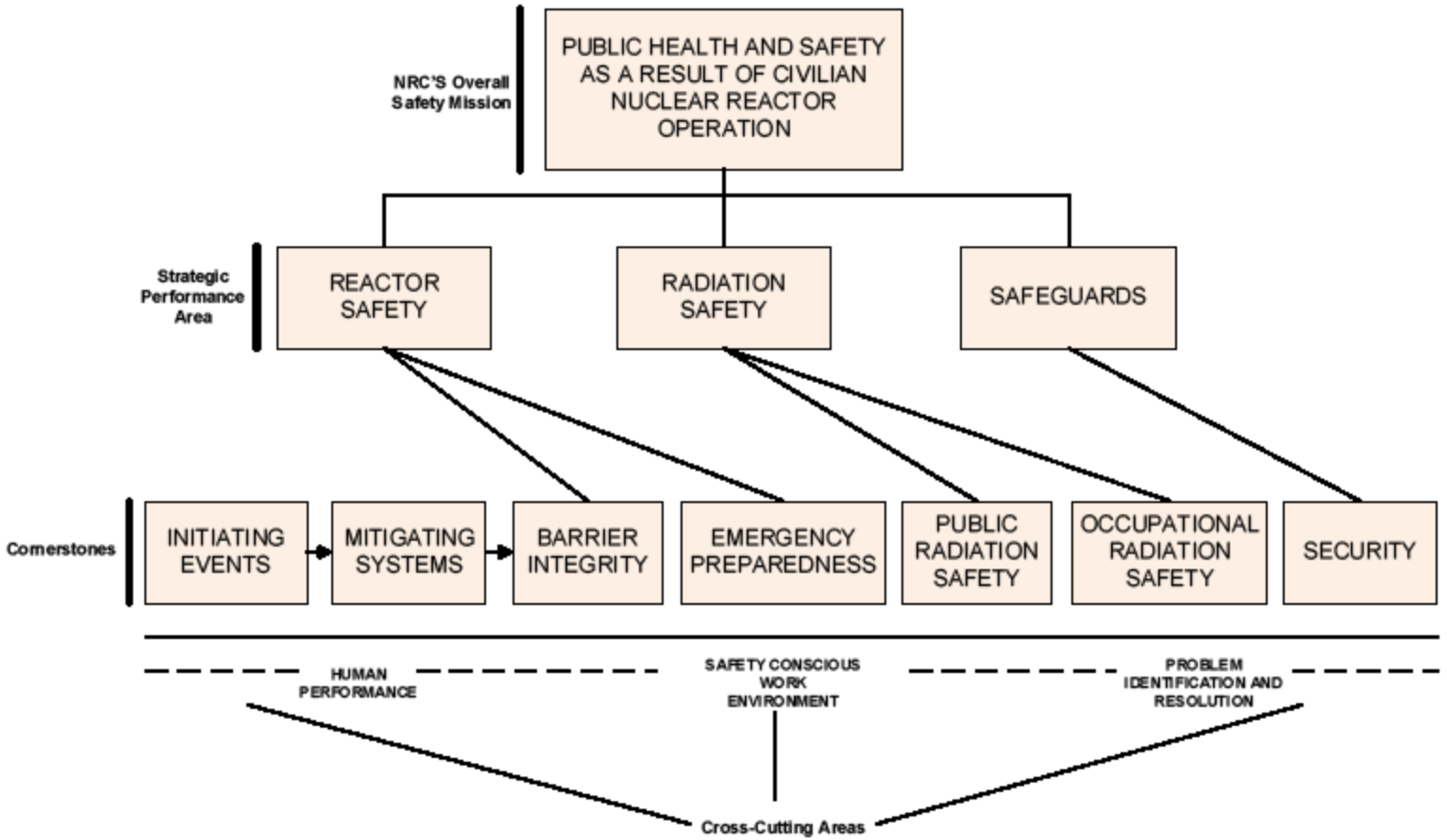
REGULATORY FRAMEWORK



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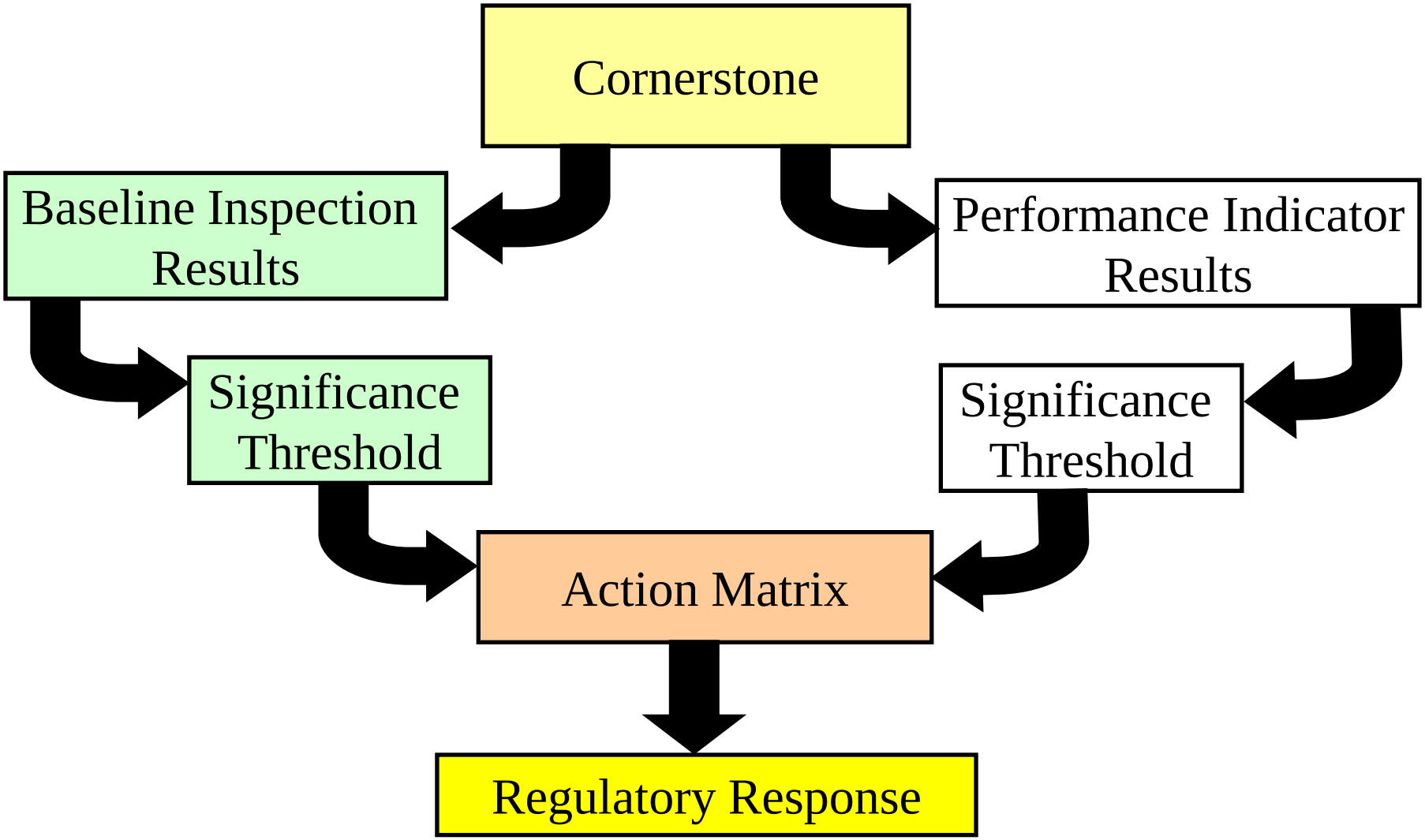

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Guiding Principles

Principles of Good Regulation	ROP Goals
Independence	Objectivity
Openness	Risk-informed
Efficiency	Predictability
Clarity	Understandability
Reliability	

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Technical Basis and Examples of Integrated Risk-Informed Approach Using Qualitative Measures

Jeff Circle

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Staff's Objectives and Considerations

- Produce a methodology representing one possible way in which a process can be developed to use qualitative measures in an integrated risk-informed approach
- The term "qualitative measures" more accurately depicts the intent of the proposal in SECY-12-0081
- Easily understood and traceable technical basis
- Conceptual in nature as an illustrative example
- Can be applied to new reactors and the existing operating fleet
- Consistent with NTTF Recommendations 1 and 12 and will be coordinated with those efforts

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Technical Bases

- PRA Policy Statement of 1995
- RG 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to Licensing Basis”
- SECY-98-144 (Revision 1), “White Paper on Risk-Informed, Performance Based Regulation”
- SECY-99-007A, “Recommendations for Reactor Oversight Process Improvements (Follow Up to SECY-99-007)”
- NUREG-1860, “Feasibility Study For a Risk-Informed and Performance-Based Regulatory Structure for Future Plant Licensing”

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Concept Development

- ROP-SDP is a risk-informed process to evaluate licensee performance deficiencies in order to allocate inspection resources
  - Has a ***quantitative*** core damage and large early release frequency aspect
  - Has a ***qualitative*** aspect
  - As a risk-informed process, both should be considered together to arrive at a determination
- Quantitative measures of SDP are well defined
- This proposed concept gives further guidance and structure for qualitative measures

Overview of an Integrated Approach

- Develop a set of qualitative elements to model degradation and credit
- Rate the level of degradation or credit of qualitative elements in a structured framework
  - Helps promote clarity and traceability of decision making for all stakeholders
  - To avoid double-counting, qualitative credit would be considered for those actions that fall outside of the PRA quantitative evaluation
- Arrive at a single qualitative rating
- Apply and aggregate qualitative rating together with the quantitative result
- Use a table to arrive at a color band assessment

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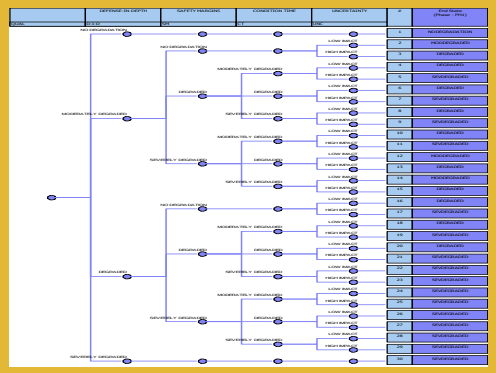
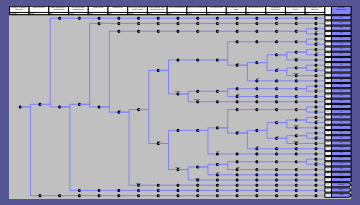
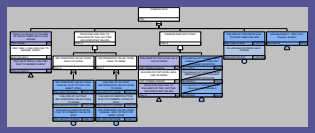
The Overall Concept for the Framework of the Integrated Risk Approach



Qualitative Risk Evaluation





Quantitative Risk Evaluation

Aggregate Qualitative Rating

Final Determination Table

ΔCDF (CCDP normalized to 1 year) →	≤10^{-6}	10^{-6} – 10^{-5}	10^{-5} – 10^{-4}	> 10^{-4}
ΔLERF (CLERP normalized to 1 year) →	≤10^{-7}	10^{-7} – 10^{-6}	10^{-6} – 10^{-5}	> 10^{-5}
Qualitative Rating ↓				
Reduced Impact	Green	Green	White	Yellow
Neutral Impact		White	Yellow	Red
Increased Impact	White	Yellow	Red	Red
Significantly Increased Impact	Yellow	Red	Red	Red

New Reactor Example

- Performance Deficiency
  - Emergency Feedwater for the US-APWR to be unavailable for 3 months
  - Extent-of-condition evaluation showed potential to impact other qualitative elements
- Quantitative evaluation yield a ΔCDF of ***7.7 x 10^{-6} per year***, quantitatively White
- Using the qualitative measures and evaluating this through the conceptual framework, this could be Yellow without qualitative credit or White with credit

Future Developmental Considerations

- Avoid double counting the qualitative measures with respect to the quantitative analysis
- Develop guidelines for application of qualitative credit
- The number of qualitative elements and impact ratings to define and use
- Accounting for scoping changes of SSCs in and out of technical specifications
- Develop framework for the impact and overall qualitative ratings
- Accounting for uncertainty

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Technical Evaluation of Relative Risk Measures and Reexamination of Pros and Cons

Eric Powell

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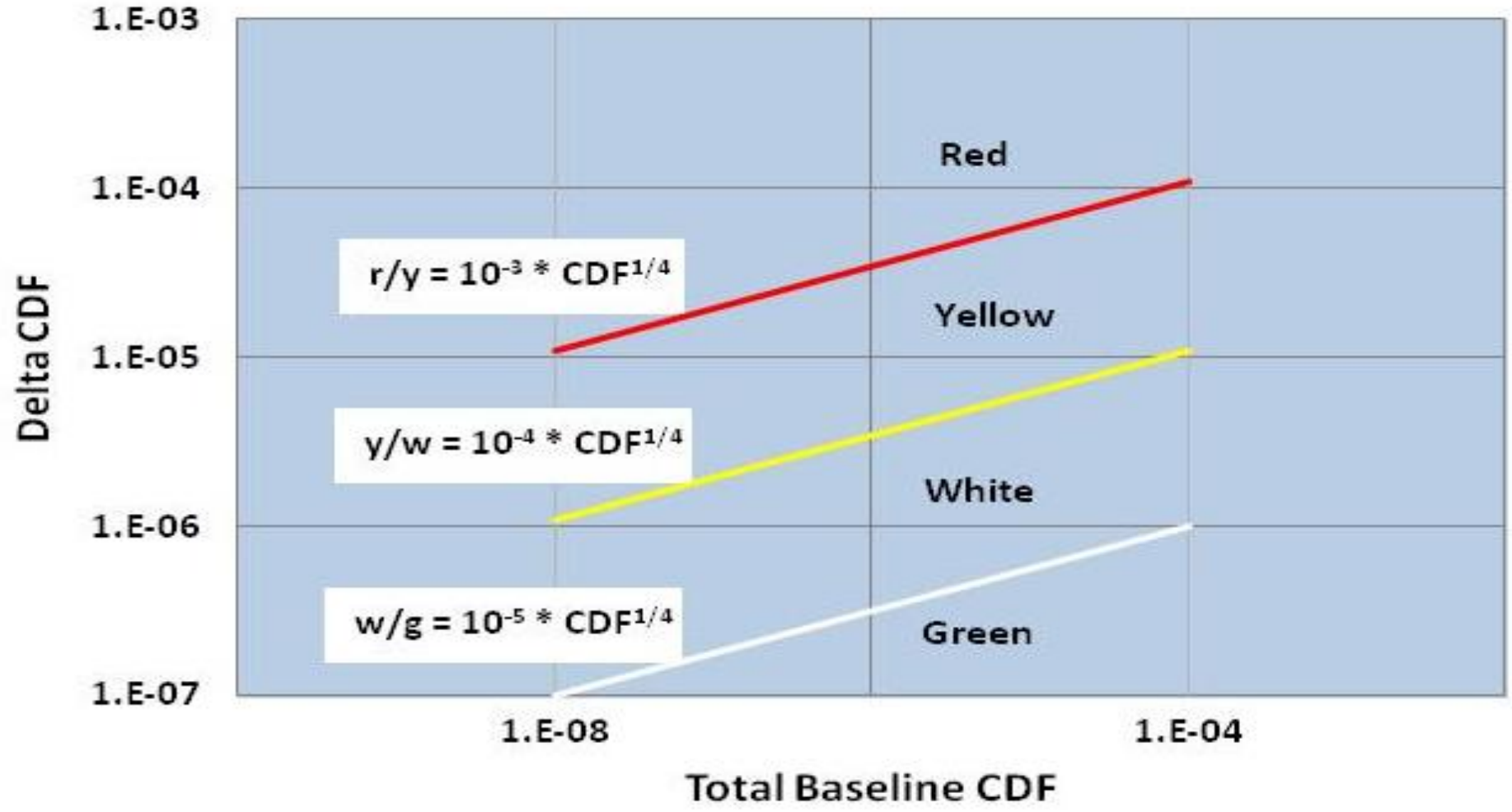
Relative Risk Approach – ACRS Recommendation Converted to ΔCDF (y-axis)



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Relative Risk Approach

- Uses the total baseline CDF (x-axis) and the ΔCDF (y-axis) for a plant to determine the significance of an inspection finding using sloped lines for the thresholds
- Concept behind this approach is that the lower the baseline CDF of a plant, the lower the ΔCDF value, or larger fractional change, necessary for increased significance of a finding
- Significance of a finding would be relative to the baseline CDF value, instead of the current approach which does not change given a particular plant's baseline CDF

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Technical Evaluation of Relative Risk Approach

Design	Example	Exposure Period	ΔCDF (/yr)	Model	2011 Tabletop Outcome	Applying Relative Risk Approach
ABWR	HPCF pump fails	23 days	1.4E-8	SPAR		
		1 year	2.2E-7			
	Both HPCF fail due to common cause	23 days	4.8E-8	SPAR		
		1 year	7.7E-7			
US-APWR	One TDEFW pump fails	1year	2.2E-5	SPAR		
		1year	3.4E-6	PRA importances (internal events)		
		1year	3.4E-6	MHI PRA (internal fire and flooding)		
	Both TDEFW pumps fail due to common-cause	1year	4.4E-4	SPAR		
		1year	3.4E-5	PRA importances (internal events)		
		1year	8.8E-6	MHI PRA (internal fire and flooding)		
ABWR	RCIC pump unavailable	1 year	4.1E-7	SPAR		
	RCIC pump and both HPCF pumps unavailable	1 year	1.6E-6	SPAR		
US-APWR	One MDEFW pump and one TDEFW pump unavailable due to lost suction source	1 year	1.3E-4	SPAR		
		1 year	7.7E-5	MHI PRA (internal fire and flooding)		
U.S. EPR	One train of EFW unavailable due to lost suction source	1 year	7.7E-7	Areva PRA		
AP1000	PXS-V121A fails to remain open due to disk-stem separation	295 days	9E-5	SPAR		
		1 year	1.1E-4	SPAR		
US-APWR	RV head corrosion (increase medium and large LOCA frequencies)	1 year	1.4E-7	SPAR		
AP1000		1 year	1.2E-6	SPAR		

Technical Evaluation of Relative Risk Approach (cont.)

- Staff took the scenarios from the 2011 tabletops and applied the relative risk approach
- The result was an increase in the significance (e.g. regulatory response) of some findings compared to the existing approach
- Tabletops did not include external events (e.g., seismic, flooding, and fires)
  - External events, particularly seismic events, will likely dominate the PRA results of plants with low CDF values for internal events
  - When external events are included this may decrease the significance for some findings

Reexamination of the Pros and Cons

Pro of a relative risk approach for new reactors that was discussed during the public meetings:

- Consistent with the Commission's stated expectation to maintain the enhanced safety margins for new reactors, while providing greater operational flexibility than current reactors

Reexamination of the Pros and Cons (cont.)

Some of the more significant cons of a relative risk approach for new reactors that were discussed during the public meetings included:

- Potential to inadvertently focus licensee and staff attention on less significant safety issues
- Concerns with being inconsistent with some of the objectives of the ROP
  - Public perception issues communicating safety significance
- Concerns with creating less incentive for licensees to enhance safety margin

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Appropriateness of Existing Performance Indicators and Thresholds

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Risk-Informed vs. Deterministic

- Many of PIs are not directly risk-informed, but based on regulations and standards that would also apply to new reactor designs
- PIs directly related to risk
  - Mitigating Systems Performance Index
    - Emergency AC Power
    - High Pressure Injection
    - Heat Removal
    - Residual Heat Removal
    - Cooling Water
  - Unplanned Scrams per 7,000 Critical Hours
- Remaining PIs and thresholds are more deterministic

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Evaluation of PIs

- Mitigating Systems Performance Index
  - Application evaluated in SECY-12-0081, “Risk-Informed Regulatory Framework for New Reactors”
  - Ineffective in determining an appropriate regulatory response for active new reactor designs
  - Meaningful MSPI may not even be possible for passive systems using the current formulation of the indicator
- Unplanned Scrams per 7,000 Critical Hours
  - CDF sensitivity studies conducted to inform initial threshold setting
  - Conservative thresholds set for existing fleet
  - Existing thresholds of performance bound lower risk of new reactors

Existing PI Appropriateness

- Mitigating Systems Performance Index
  - Alternate PIs could be developed or additional inspection could be used for new reactors
- Unplanned Scrams per 7,000 Critical Hours
  - Can be applied to new reactor designs
  - Threshold values are set conservatively and will account for lower risk of new reactors
- Unplanned Scrams with Complications
  - Need to define complicated scram in PI reporting guidance
- Remaining PIs can be applied to new reactor designs to determine an appropriate regulatory response

Staff Conclusions

Integrated Risk-Informed Approach

- An integrated risk-informed approach using qualitative measures is an appropriate means to identify the potentially significant performance issues that would not otherwise be revealed solely by the risk calculations to ensure an appropriate regulatory response
- An integrated risk-informed approach would provide a clear and efficient way of ensuring reliable and predictable regulatory responses within the existing ROP framework, consistent with the principles of good regulation

Staff Conclusions (cont.)

Relative Risk Approach

- Although the relative risk approach may potentially have merit, the cons of the relative risk approach outweigh its benefits

Appropriateness of Performance Indicators

- Many of the PIs are based on regulations and standards that also apply to new reactor designs
- Some PIs in the Initiating Events and Mitigating Systems cornerstones warrant further analysis to fully develop appropriate PIs, thresholds, or guidance for new reactor applications

Staff Recommendations

- **Recommendation 1**: Commission approves the staff's plans to develop qualitative measures and an integrated risk-informed approach to ensure an appropriate regulatory response to performance issues for new reactor designs
- **Recommendation 2**: Commission approves the staff's plans to develop appropriate PIs and thresholds for new reactor applications to address identified shortfalls to ensure that all cornerstone objectives are met
- Details developed and evaluated over time with stake-holder involvement and adjusted based on experience
- Present details to Commission prior to implementation

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Summary of Changes to Draft SECY

- NOTE: Format of paper and staff's conclusions and recommendations will not change substantially; supporting facts and arguments will be strengthened and clarified
- Update as necessary to reflect ACRS and industry interactions and feedback
- Provide clearer tie of staff's conclusions to the ROP goals and principles of good regulation
- Address potential inconsistencies between the main body and the details in the enclosures
- Provide better balance of pros and cons to each approach

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Summary of Changes to Draft SECY (cont.)

- Emphasize that qualitative measures will be designed to capture performance degradation
- Emphasize that Enclosure 2 is conceptual to demonstrate a potential approach to integrating qualitative measures vice the definitive approach
- Additional clarifications and explanation will be added throughout the paper to avoid the perception that this approach has been fully developed and vetted
- Add to the technical basis for using an integrated risk-informed approach with qualitative measures as well as a conclusions paragraph

Summary of Changes to Draft SECY (cont.)

- Clarify that a relative risk approach may have merit, but the cons to such an approach outweigh the potential benefits
- Improve cons and supporting explanation associated with relative risk approach
- Make minor improvements to the PI appropriateness discussions and Enclosure 4

Summary of Changes to Draft SECY (cont.)

- Add discussion of other ROP processes that could be leveraged, such as self-assessment and ongoing improvements, Action Matrix deviations, and all findings in CAP and evaluated for CCAs
- Address the industry's proposal to postpone making any changes and use the existing ROP until operating experience is available
- Note that the proposed integrated approach is consistent with current processes used to evaluate findings and determine event response

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Summary of Changes to Draft SECY (cont.)

- Emphasize that details of integrated approach using qualitative measures will need to be developed over time with stakeholder involvement and adjusted based on experience
- Note that the approach, once developed, could be tested and evaluated via tabletop or pilot exercises
- Add discussion of plans to go back to Commission with details prior to implementation

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Update to Emergency Core Cooling System (ECCS) Regulatory Guides (RG) for the Initial Test Program (ITP)

RG 1.79, Preoperational Testing of ECCS for Pressurized Water Reactors, Revision 2 (DG-1253)

RG 1.79.1 Initial Test Program of ECCS for new Boiling Water Reactors, Revision 0 (DG-1277)

Presented by: Francis X. Talbot, P.E., NRC/NRO/DCIP/QVIB

ACRS Briefing
September 5, 2013
Rockville, MD

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Outline: DG-1253 (Update to RG 1.79, Revision 2) and Creation of DG-1277 (RG 1.79.1, Revision 0)

- Background Information/Objectives for Updating RG 1.79 and Creating RG 1.79.1
- Summary of RG 1.79 and RG 1.79.1 Revisions from Public Comments
- Summary of ACRS Subcommittee Comments on Regulatory Guide (RG) 1.79 and RG 1.79.1
- Questions

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Background Information

- The NRC staff identified the need to update RG 1.79, Revision 1 due to NRC review of PWR design certification applications. The staff identified five new ECCS preoperational tests in new PWRs (US APWR, US EPR and AP1000).

- The NRC staff identified that a new RG 1.79.1 should be created for testing ECCS in new BWRs.

- Motivation for updating RG 1.79 and creating RG 1.79.1

  - RG 1.79 was last issued in 1975
  - Since 2008, NRC reviewed new LWR DC and COL applications with new testing information for ECCS
  - Lessons learned from ITPs over 37 years.

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Background Information: NRC Regulations and Guidance for the Initial Test Program

RG 1.79 and RG 1.79.1 guidance should meet these regulations and other guidance documents:

- 10 CFR 50, Appendix A, General Design Criteria (GDC) (GDC 4, 5, 33, 34, 35, 36, 37 and 55)
- 10 CFR 50, Appendix B, Criterion XI, “Test Control”
- 10 CFR 50.34(b)(6)(iii) and 10 CFR 52.79(a)(28)
- NUREG-0800, SRP Section 14.2, “Initial Plant Test Program – Design Certification and New License Applicants” and (RG 1.68, Revision 3 or 4, “Initial Test Programs for Water-Cooled Nuclear Power Plants”)

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Objectives - Why is RG 1.79 being Revised?

- RG 1.79, “Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors,“ Revision 2, includes:

  - Five new ECCS preoperational tests for new PWRs using the 10 CFR Part 52 Design Certification application process (e.g., U.S APWR, U.S. EPR and the AP1000).

  - New Lesson Learned Operating Experience for ECCS Testing in PWRs.

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Summary of Revisions to RG 1.79: Regulatory Guidance for ECCS Systems in New PWRs

RG 1.79 was revised to add guidance for five Preoperational Tests in new PWR designs:

- New Medium Pressure Safety Injection Preoperational Test (Westinghouse Four Loop PWRs, US EPR) (C.1.b)
- New Emergency Letdown System Preoperational Test (US-APWR) (C.1.e)
- New AP1000 Passive ECCS Preoperational Tests
  - Passive Core Cooling, Safety Injection (C.1.f)
  - Passive Core Cooling, Emergency Makeup and Boron Injection (C.1.g)
  - Passive Core Cooling, Emergency Core Decay Heat Removal (C.1.h)

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Objectives
Why was RG 1.79.1 Created?

- RG 1.79.1, “Initial Test Program of Emergency Core Cooling Systems for Boiling Water Reactors,” was created to include:

  - New ECCS Tests from the ABWR/ESBWR Design Certification Applications.

  - Additional lesson learned operating experience for ECCS testing in BWRs.

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Summary of Regulatory Guidance in RG 1.79.1: Testing New ECCS in the ABWR and ESBWR

RG 1.79.1 was created to provide guidance for Preoperational, Low Power and Power Ascension Tests of ECCS in new BWR designs:

- High Pressure Core Flooder (HPCF): Preoperational Test (ABWR – HPCF) (C.1.a)
- Automatic Depressurization System: Instrumentation and Flow Test and Power Ascension Test (ABWR, ESBWR) (C.1.b)
- Reactor Core isolation Cooling: Preoperational Flow Test and Low Power Test (ABWR) (C.1.c)
- Gravity Driven Cooling System – Preoperational Instrumentation and Flow Test (ESBWR) (C.1.d)

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Summary of Regulatory Guidance in RG 1.79.1: Testing New ECCS in the ABWR and ESBWR

RG 1.79.1 was created to provide guidance for Preoperational, Low Power and Power Ascension Tests of ECCS in new BWR designs:

- Isolation Condenser System (ESBWR) (C.1.e)
- Standby Liquid Control System (ESBWR) (C.1.f)
- Low Pressure Core Flooder Low Pressure Coolant Injection Flow Test – Cold Conditions (ABWR) (C.1.g)
- Residual Heat Removal System; Preoperational Test and Low Power Test (ABWR), Reactor Water Cleanup System, Shutdown Cooling System Low Power Test (ESBWR) (C.1.h)

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Summary of Revisions: Other Regulatory Guides in RG 1.79 and RG 1.79.1

RGs 1.79 and 1.79.1 identify other RGs related to ECCS testing:

- RG 1.82, “Water Source for Long Term Recirculation Cooling Following a Loss-of-Coolant Accident,” provides prerequisite guidance to evaluate the susceptibility of ECCS suction strainers to flow blockage that can effect ECCS pump performance in both RG 1.79 and RG 1.79.1.

- RG 1.205, “Risk-Informed, Performance Based Fire Protection for Existing Light Water Reactors,” Section C.3.3,“Circuit Analysis,” provides guidance for the coordination and testing of protective breakers to prevent thermal overload of electrical ECCS pump motors.

RGs 1.79 and 1.79.1 identified Prerequisites for System and Component Testing

The NRC staff added:

- Prerequisite guidance due to lessons learned from air entrainment into ECCS systems. (RIS 2013-09 endorses NEI 09-10)
- Lessons learned guidance to both the prerequisite section and Regulatory Guide Section C.2, “Component Testing,” on instrumentation and control, pumps, valves, motors, piping, etc.
- Prerequisite guidance for the SLCS system before entry into Technical Specification mode in which operability is required.

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Public Comments

Public Comments on DG-1253 (RG 1.79, Rev 2) and DG-1277 (RG 1.79.1, Rev 0):

- The NRC staff issued DG-1253 for public comment in June 2011 and DG-1277 for public comment in June 2012. The NRC staff received no public comments on DG-1253 and 45 public comments on DG-1277.
- GEH provided one general comment and a significant number of specific comments on DG-1277 related to BWR/2-6 plants. GEH noted that BWR/2-6 plants are not likely to be used in future plants.
- GEH provided a significant number of specific comments on ECCS testing guidance from the ABWR and the ESBWR design certification (DC) applications.
- The NRC staff identified 6 public comments related to component testing applicable to both RGs, Regulatory Guidance in Section C.2.

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ACRS Comments on RG 1.79 and RG 1.79.1

On December 3, 2012, the ACRS subcommittee provided 20 comments on RG 1.79 and 31 comments on RG 1.79.1.

ACRS comments related to both RGs included:

- These RGs should be updated to add prerequisites for completion of construction and preoperational tests and make the test procedures available to NRC inspectors.

- What is an acceptable level for non-condensable gases in ECCS and shouldn't the evaluation include all types or sources of non condensable gases?

- The reference to RG 1.82 is not specific enough. Please describe how RG 1.82 supports test acceptance criteria for the regulatory guidance in RG 1.79 and RG 1.79.1.

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ACRS Comments on RG 1.79 and RG 1.79.1

As a result of the 51 ACRS comments on RG 1.79 and RG 1.79.1, the RGs were revised. Some of the NRO staff proposed revisions included:

- The RGs were updated to add prerequisite guidance to include completion of construction tests and preoperational tests in coordination with the startup test group approval of test procedures, test configuration and test initiation. The procedures should be made available to NRC inspectors 60 days before intended use.
- The NRC staff added references to specific prerequisite guidance in RIS 2013-09 and NEI 09-10 to address all types of gas accumulation (i.e., air, hydrogen, nitrogen, oxygen, etc.) when evaluating non condensable gases in ECCS systems.
- The NRC staff added guidance to both RGs, supported by guidance in RG 1.82, to verify test acceptance criteria for ECCS pumps (e.g., adequate flow rates and NPSH) and, verify, by inspection, that no foreign material has entered into the pump suction lines.

QUESTIONS ?